

**TANK
HISTORY**

WORLD DOMINATION: SECRETS OF T54/55's SUCCESS

Bringing History to Life

80 YEARS AGO

The Battle of Kursk

Tank super clash
that turned back
Hitler's advance

UNDERWATER KILLING MACHINE

Innovative snorkel
transformed tank
into submarine

Back by
**POPULAR
DEMAND**

PANZER!

MEN ★ MACHINES ★ MANOEUVRES



HITTING THE WEAK SPOT

Hand grenades
destroyed
the toughest
tanks of all

HEAT OF BATTLE

Five men
squeezed in
a sweaty
steel box



WHO CALLED THE SHOTS?

The commanders
who steered tanks
through the chaos
of the battlefield



TOP TACTICS! HEINZ GUDERIAN: GENIUS BEHIND HITLER'S BLITZKRIEG

Death on tracks

With the development of the tank, big guns became truly mobile. Heavy ordnance ploughed across the battlefield on caterpillar tracks, while the vehicles' crews sheltered inside armour-plated chassis. The pace was not high, yet the effect was terrifying as the tanks crashed through buildings and blew the enemy apart with high-calibre missiles. World War I witnessed the first tanks, but it was in the period between the wars that the tactics of mobile warfare were refined. Skilled tank generals, such as Heinz Guderian, became the driving force in coordinating attacks of the new armoured forces, including the blitzkrieg campaign. In World War II, more tank models appeared. The German tanks became bigger and heavier, while the Soviets focused on speed and quantity.

In this issue, you'll find fascinating articles about the most important tanks of World War II and the monumental clashes in which they participated and discover how mobile warfare has continued in the post-war era and beyond...

Happy reading!

“German tanks became bigger and heavier”



CONTENTS

PANZER! TANK HISTORY



6 MECHANISED WARFARE



16 HEADSTRONG GENERAL



26 STALIN'S STEEL MONSTERS





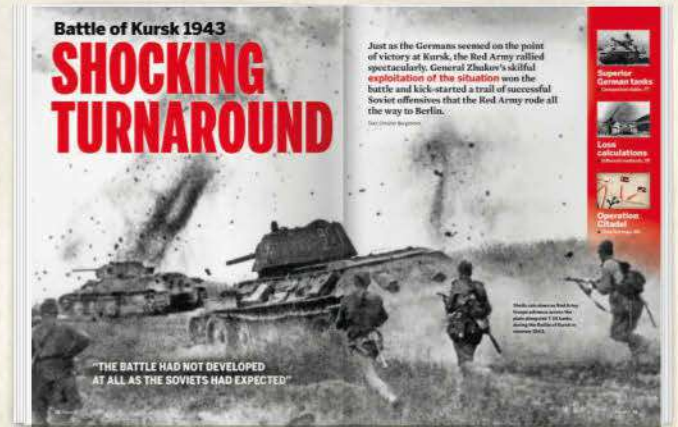
38 HITLER'S TANK HUNTERS



50 PANZER V PANTHER



60 TANKS IN BATTLE



74 SHOCKING TURNAROUND



94 DESPERATE OFFENSIVE



102 THE WORLD'S TANK

TANKS



MECHANISED WARFARE

The first tanks didn't move much faster than the average jogger, but despite that they helped usher in an **era of mobile warfare**. After early trials in World War I, tanks and the tactics that accompanied developed rapidly right across Europe.

Text: HARALD SONESSON & MARCO SMEDBERG

Panzer I tanks in a German propaganda film from 1936. During the interwar period, several countries developed the tactic of having tanks breaking through enemy lines and fight their way through enemy territory.



ULLSTEIN BILD/ALL OVER PRESS

The world's first tank duel was fought on the Western Front in World War I on 24th April, 1918 at the town of Villers-Brettonneux. During the second armoured attack of the war, the Germans occupied the town after using gas attacks and 13 A7V tanks. There were three British Mark IV tanks stationed nearby. In spite of the fact that several British crew members had been killed in the gas attack, two 'female' tanks equipped with multiple machine guns moved forward. An hour later they met the Germans. The terrain was full of trenches that the tanks were forced to drive around while they tried to engage each other.

THE BRITISH MACHINE GUNS were no match for the German A7V tanks and the British tanks were shot to pieces. Then a third British tank appeared on the battlefield. It was a Mark IV and managed to score a hit on the side of one of the German tanks. As a result, the battle was aborted. A little later, this third British tank was knocked out by an artillery shell. The two tank types that met in Villers-Brettonneux were at the forefront of technological developments at the time. The British Mark IV with an eight-man crew could move forward at a maximum speed of six kilometres per

"THE IDEA WAS TO MOTORISE AND PARTIALLY ARMOUR THE ENTIRE FORCE"

hour, while the 18-man German A7V could travel twice as fast.

THE DEVELOPMENT OF TANKS began in the autumn of 1914 with the aim of supporting unprotected infantry. When the general staff questioned the idea of armed and armoured 'tractors' the First Lord of the Admiralty, Winston Churchill set up a Landship Committee in February 1915 to develop armoured fighting vehicles. The term tank – as in water tanks – was used to keep the project secret. One year later, the British Army ordered 100 copies of the Mk I and the first tanks were used in the Battle of the Somme in of 1916. The tanks were technically unreliable, and they were also driven into difficult trench terrain where many became stuck. However, the British command thought the concept was promising and ordered 1,000 new Mark IV tanks. At the same time, the French ordered and built 400 of their own Saint Chamond tanks.

The British undertook the first armoured attack on Cambrai on 20th November, 1917. 324 Mark ►

TANKS

- ▶ IV tanks launched a surprise attack in relatively open terrain during a lull in the fighting. In just a few hours, the British advanced six kilometres with relatively few losses. But they still had some issues. In addition to the fact that the tanks were unreliable, they also lacked decent communications systems – making effective command difficult.

Eventually the Germans managed to isolate the tanks by taking out the infantry advancing behind the Mark IVs. But even though the British tanks had failed to make a significant breakthrough during the attack, they had shown their potential.

Compared to the Allies, the Germans built far fewer tanks. In 1918, their full complement consisted of 20 German-built vehicles and 25 tanks captured from their opponents, all organised in nine tank companies. However, the Germans had the best response to the Allied tanks – artillery.



General Fuller.

DURING WORLD WAR I, defensive fire dominated. When attacking, cavalry was too vulnerable and infantry too slow. The defending forces could always deploy reserves faster than the attackers could advance, especially if they exploited the rail network to transport them. Tanks alone were not enough to break through enemy lines. Tanks

became vulnerable when the unprotected infantry that followed them stalled, which often happened. So, the challenge in the interwar period was to develop and translate the demonstrated advantages of their tactical movement on the battlefield during 1918 into operative mobility, where various forces could combine to make a greater impact.

After World War I, forward-looking military leaders began to find a solution in line with advances in motorisation. The idea was to motorise and partially armour the entire force, including all their support functions. Then it would be possible to create and sustain a high-enough attack speed so that, after a tactical breakthrough, the whole offensive force could surge forward and capture objectives behind enemy lines.

But it was one thing to imagine this radical solution, but quite another to build the skills and expertise needed to implement it. The military had to fight against cutbacks in an era of peacetime reconstruction. At the same time, critics argued that armoured attacks could be fought with artillery. In addition, there was always a risk that armoured attacks behind enemy lines could be cut off or wiped out if the enemy also had armoured forces that could counterattack. But this was all theoretical.

Initially, the British led the development of armoured warfare. One of the main figures behind

British armoured forces during an exercise on Salisbury Plain in August 1938. The first tank is a medium heavy Vickers Mark IIA. Then follow a Mark V and three Mark VI.



this was Major General John Fuller who, during the war, had been a staff officer in the British Tank Corps. He was behind Plan 1919, which was an innovative military strategy in which tanks would be used not to wipe out the enemy but to rapidly advance into the enemy's rear to destroy supply bases and lines of communication, and to cripple the German command centre. The plan took a long time to come to fruition, however, and World War I ended before it could be put into action.

Another British military theorist was Captain Basil Henry Liddell Hart. His ideas were well known as he was a widely-published military historian. While Fuller focused solely on all-tank forces, Liddell Hart was interested in integrated forces where tanks, infantry and artillery worked together. But they had something in common – both these military strategists wanted to break through enemy lines and then penetrate deeply in order to paralyse the opponent.

Influenced by these concepts, the British Army organised an Experimental Mechanised Force in 1927. It was the first independent mechanised unit in the world (there were both tanks and infantry in armoured vehicles) and the exercises it undertook were publicised in the press. The British invested in two different types of combat forces: heavy infantry tank units

“INITIALLY, THE BRITISH LED THE DEVELOPMENT OF ARMoured WARFARE”

to provide support, and a lighter cavalry force to clear up and take advantage of breaks through the enemy lines. In both types of forces, the development of tanks was prioritised – other military functions and troops were considered less important. A lack of money and a strong conviction about the effectiveness of an armoured defence meant that the British army discontinued development and even dissolved units in other areas.

IN FRANCE, DEVELOPMENTS were moving in a different direction, despite the fact that over 3,000 different tanks and armoured vehicles were built during the war. In comparison to their previously offensive stance, the French now went to the other extreme and advocated a distinctly defensive doctrine. This led to the creation of the Maginot Line along the French-German border. It should be noted, however, that Colonel Charles de Gaulle in 1934 suggested that France should abandon widespread military conscription and instead pursue a fully mechanised professional army with an offensive capability of 100,000 men. The French military leadership, determined to hold ►



TANKS

► on to its defensive military strategy, was annoyed by the fact that de Gaulle questioned the prevailing dogma and deployed the tanks to support infantry.

During the Civil War in Russia in 1918–1921, the Red Army began to experiment with mobile warfare. The military theory that was developed under the young Soviet Union, known as Soviet Deep Battle, involved forces attacking deep into the heart of the enemy's battle lines. This subsequently led to a new concept – shock armies that contained both tanks and motorised vehicles. Thanks to the influential Marshal Mikhail Tukhachevsky, the Red Army became a world leader in the use of mechanised forces, although the secrecy of the Soviet Union meant the outside world remained largely unaware of the fact. In the early 1930s, it organised both mechanised brigades and a mechanised division – three years before the Germans.

But the concept had problems. Stalin, who was extremely suspicious of any possible opposition, started purges that hit the Red Army hard. Tukhachevsky was executed, along with many other skilled officers. The strategy of taking operations deep into enemy lines was replaced by a more traditional approach of mass attacks, one that was considered to be less elitist and more politically correct. The armoured forces were split into smaller

“THE FRENCH... ADVOCATED A DISTINCTLY DEFENSIVE DOCTRINE”

units and dispersed. The Soviet armoured forces' poor performance in the Spanish Civil War of 1936–1939 further reduced their status. One exception to this negative development was General Georgy Zhukov's victory at the Khalkyn Gol River along the Mongolian Manchurian border in August 1939. There, Zhukov's army, including two mechanised brigades and two all-tank brigades, defeated two Japanese divisions by advancing around both sides in a classic pincer manoeuvre. The Red Army would later use this same method against the Germans.

Charles de Gaulle (on the right) talks French President Albert Lebrun through a combat exercise in October 1939.

ACCORDING TO THE peace treaty agreed after World War I, Germany was prohibited from developing its own tanks. In spite of the fact that the small, 100,000-strong *Wehrmacht* (German armed forces) consisted mainly of light-infantry forces, they were far-sighted enough to begin to train different mobile troop divisions on how they should interact, sometimes using bicycles in place of tanks during exercises.

The Germans received an opportunity to train using modern equipment when a secret military



ROGER-VOLLET/BLIUBRYA



pact between Germany and the Soviet Union was signed in 1922. In the Soviet Union, German officers could study new equipment and strategies that they themselves were not allowed to use. German tanks were tested there. At the same time, the Red Army gained access to the Germans' ideas and technology. The cooperation continued until 1933, despite the two nations' mistrust of one another.

Major General Oswald Lutz became the inspector of the German motorised troops in 1931, with Lieutenant Colonel Heinz Guderian as his chief-of-staff. Both greatly influenced the Wehrmacht's motorisation and the development of armoured troops. (In Germany, mechanised forces were called armoured forces – which must not be confused with all-tank forces, which were a part of these armoured forces.) Three armoured divisions were created in 1934. In the discussions that followed, there were major differences of opinion. How should the rearmament take place? How would the new mobile warfare be implemented? Should the armoured forces be geared towards securing operational targets behind enemy lines or to help the infantry encircle the enemy? Along with others, Guderian initially opposed independent armoured troops. For him it was important to secure the army's overall capability and therefore different military divisions had to share the limited resources available.

BUT HE HAD to give way to Hitler in March 1935 who, ignoring the armistice restrictions of the Versailles Peace Treaty, ordered the expansion of the armed forces, which led to several problems for the now prioritised armoured forces. The German

arms industry was starting from scratch, and efforts to find technically perfect solutions reduced the speed of development and production. Since tanks were not being produced, armoured divisions became marginalised. Nor did the army get access to all the combat equipment they needed. Both the infantry and the cavalry demanded, and got, their own free-standing battalions with tanks and self-propelled artillery.

THE FIRST FIGHTING experience for the German armoured troops was in the Spanish Civil War in 1936–1939. A preliminary contingent of 33 Panzer I tanks were sent to Spain. The tank was equipped with machine guns, but it was small, poorly armoured and only had a two-man crew. German staff served as instructors to educate Spanish crews who were later deployed in battle. As an emergency solution, five anti-tank guns were distributed to each tank company to help defend against enemy tanks. In total, just over 100 Panzer I tanks were sent to Spain.

War at the time was characteristically static. The continuing inability of armoured forces to lead tactical manoeuvres led initially to poor results that seemed to confirm that the usefulness of tanks had been overstated. But champions for the use of tanks claimed the results were due to there being too few tanks and those they did have being too poorly equipped. These evangelists advocated the need for fully-trained armoured forces to make any large-scale trial of modern mobile warfare meaningful.

There was disparity in the development of tanks during the interwar period. Lightweight tanks ►

In order to train armoured forces how to coordinate with non-existent equipment, the Germans used cardboard models of tanks that were mounted on bicycles as seen in this German exercise from 1925.

TANKS

A captured Soviet T-26 B-2 and German Panzer II in the Nationalist Army during the Spanish Civil War. Neither the Soviet Union nor Germany were happy with how the tanks performed there.

► possessed relatively good speed but had poor weapons and armour. They were best for mopping up. An intermediate class of tanks had good speed and weapons, but at the expense of armour, which was weaker. This was the case, for example with the Soviet BT-5 tanks. These fast-paced cavalry tanks were designed for battle deep behind enemy lines – the traditional mission of the cavalry.

A THIRD CLASS – the infantry tank – was designed to break through the enemy front and support infantry forces, which required them to have tougher armour and better weapons. Their heavier weight made them relatively slow.

The French Char B1 tank is one example of a heavy infantry tank. It would break through the enemy's frontline by destroying opposing troops and field fortifications with a 75-mm howitzer. The design had its roots in a development project initiated in 1921, and prototypes of this tank were delivered in 1930. After a few years of technical and tactical tests and exercises, the first order was received in 1934 for seven Char B1 tanks. The Char B1 also had a 47-mm gun in its turret, thicker armour and a stronger engine. It was expensive to build and cost three times as much as the smaller Char D2 tank, which was equipped with a 47-mm

gun only. De Gaulle ordered a larger number of Char D2 tanks at the expense of Char B1s.

These tanks were basically artillery on tracks, in this case a 75-mm howitzer with a relatively short barrel. A 47-mm gun in a turret was a solution found later, when it was understood that the tank would have to fight hostile armoured vehicles. The original howitzer was operated by the machine gun operator and was moved by turning the entire tank. The turret gun was loaded and fired by the tank commander, who was also in charge of what happened on board, such as giving the order to fire or passing instructions to the driver. If the tank commander also led a troop or company, he also had other tanks in the force that he had to lead. It was not the best situation, and indeed was worse in tanks with two- and three-man turrets that were common at the outbreak of war in 1939. The other crew members in these tanks were the howitzer loader and a radio operator.

The Char B1 tank was developed and produced for a completely different type of battle than that in which it actually participated. When World War II broke out, this tank was an anachronism from World War I with its large track belt assembly that wrapped around the entire body of the tank, the fixed howitzer and its small-action radius. That the



Char B1 tank was at all part of the story is mainly because it was equipped with thick armour and a relatively potent 47-mm gun. This gun was effective against the poorly protected German tanks.

The Soviet Union's first five-year plan in 1929–1934 had set high targets for Red Army equipment, both in terms of development and production volume. Soviet manufacturing had a poor technical capacity, but through a variety of means, including the purchase of armoured vehicles from abroad, conditions were set for accelerated development. A separate company had been established in the US for the purpose exporting a small number of Christie-type tanks. These tanks were sold without a turret in order to bypass the US export restrictions to the Soviet Union. J Walter Christie was a self-made engineer and inventor who, with limited success, had tried to get the US and British Armies interested in the construction of his tanks.

The imported tanks heralded the introduction of a series of cruiser tanks called BT (Bistrokhodnij) Tank, meaning fast tank). These tanks could move forward on either a track belt or with wheels, so longer journeys were now possible without damaging the sensitive tracks. The BT-5 was the first BT tank to be produced in larger quantities; a total of 5,000 were produced between 1932 and 1935. The tank had a crew of three and could change from

“AS AN EMERGENCY SOLUTION, FIVE ANTI-TANK GUNS WERE DISTRIBUTED TO EACH TANK COMPANY TO DEFEND AGAINST ENEMY TANKS”

wheels to tracks in 30 minutes. It was armed with a 45-mm gun and a machine gun. One version was equipped with a radio and was intended for tank commanders. The other tanks lacked radio, and so communicated with flags. The radio-equipped tanks were easy to identify as the antenna was mounted on the turret.

PROTOTYPES VERSIONS INCLUDED tanks with snorkels for use in deep water, tanks that could emit smoke and tanks that could lay bridges. The idea was that each could carry out independent operations behind enemy lines. An important development was a version that was equipped with a short 76-mm howitzer that increased the tank's firing range.

The BT-5 took part in battles in Manchuria against Japan in 1934–1935, in the Spanish Civil War and in the Winter War against Finland. In battle, the Soviets soon discovered that the tank bonnets were too weak and that the nails holding ▶

The American engineer Walter Christie developed a new wheel suspension system which meant the T-3 tank could run without tracks. Picture from 1936.



ILLUSTRATION BY AL OVERPRESS



The heavy French tank Char B1.

Three important tank types

★ The table compares three different types of tanks from the interwar years. The French Char B1 was an infantry-support tank for use in relatively static battles. The Soviet BT-5 was a cavalry

tank that went behind enemy lines to destroy supplies and communication lines. The German Panzer II was a tank that could support infantry attacks and fight other tanks.

	Char B1 Bis	BT-5	Panzer II C
Production year	1937–40	1933–35	1937–40
Number	approx. 400	approx. 5,000	1,113
Weapons	Gun: 47-mm L/32, Howitzer: 75-mm L/17	Gun: 45-mm M1932 L/46	Gun: 20-mm KwK 30 L/55
Armour: turret/chassis (front)	56/60 mm	13/13 mm	16/14.5 mm
Weight/tonnes	31.5 tonnes	11.5 tonnes	8.9 tonnes
Horsepower/tonne	9.7	30	16
Ground pressure	0.85 kg/cm ²	0.61 kg/cm ²	0.73 kg/cm ²
Max speed	25 km/h	65/112 km/h	40 km/h

L-value of the guns shows the length of the barrel. It is calculated by dividing the length by the diameter. A longer barrel (value to the right) shows a higher initial velocity and a better ability to break through armour than a shorter one. The number

of horsepower/tonne gives a picture of the engine's strength. A lower ground pressure provides better ability to move quickly over different terrain. The two values given for the speed are measured with the tracks and wheels, respectively.

BT-5 command tank with a radio antenna on the turret, and the BT-2, which was the first version of the BT tank.



14 Panzer!

► them were not well constructed. The subsequent BT-7 tank, which was delivered from 1935, had a properly welded chassis and thicker armour. But Red Army policy was changed because of Stalin's purges, and the weakly-armoured BT-5 tanks were used to support the infantry. The result was catastrophic, with most of the BT-5s being wiped from the Red Army's inventory lists when they came up against the superior German armoured forces in the summer of 1941. On the other hand, Christie's tank and track unit survived via the T-34. Indeed, those same belt tracks are found in models that were produced long after the end of World War II.

WHEN ARMoured TROOPS were established in Germany in 1934, the following main areas of operation were quickly identified: acting as support for infantry attacks, combating enemy tanks, and conducting actions alongside other motorised units.

As in other countries, opinion was divided on which of the first two roles should take precedent. Early on, two new types of tanks were defined. One would provide partial infantry support with machine guns and other weapons whilst also having ample ability to combat enemy tanks. The other would have a purely support role, being equipped with a gun suited to defeating ground troops. The first model was eventually named *Panzerkampfwagen III* (Panzer III) and the other was *Panzerkampfwagen IV* (Panzer IV).

These two types of tanks, and the forces they were supposed to join, faced tactical and technical delays in development. It was understood that changes would need to be made continuously throughout the production period, for both the prototypes and the final tanks. So, manufacturers with experience of large-scale serial production, such as truck makers, were deliberately avoided. Instead they chose manufacturers capable of handling changes during the production process.

It soon became clear that the Panzer III and IV would not be available in larger numbers until 1938 or 1939. Long before this, however, the training required as part of rearmament had to start. The solution was to copy an existing foreign tank model in order to develop a tank primarily for education and training: the Panzer I. The Panzer II was then developed quickly in order to provide Germany with the ability to combat enemy armoured vehicles. Both of these tanks were regarded primarily as a stop-gap solution pending the arrival of the tanks in development. Those that felt that support for the infantry in battle was the most important, believed that the Panzer I and II were essentially good enough to meet those needs and that the Panzer III and IV would only be needed in small numbers. Others pointed to developments in France. There,



The German Panzer I and Panzer II (closest) were primarily developed to teach German industry to build tanks and provide troops with training equipment. Yet, they were used in large numbers until as late as 1943. Picture from France 1940.

the armour protection on tanks had increased to 30 mm or more on the front of tanks and a 47-mm gun with armour-piercing shells had become standard.

PANZER I AND II tanks were still produced in large volumes. This was partly because tanks were needed for training so that when the main tanks were finally ready the crews would know how to use them, and partly because manufacturers needed to build up their expertise in tank production. The Panzer II was relatively successful, despite its hurried conception. Its crew consisted of three men: a combined tank commander and gunner, a gun loader, and a radio operator and tank driver. The main weapon was a 20-mm gun with armour-piercing capability in a manually operated turret. The gun was automatic and had a six-shot magazine. However, the gun couldn't penetrate armour that was more than 20 millimetres thick. The machine gun was the only effective weapon on the tank against troops. Having a tank commander who was both commander and gunner didn't prove successful. This was, however, also a compromise solution in order to stay within the size and weight specifications. The Panzer II was produced from December 1942 for use on secondary fronts.

By the time war broke out in 1939, the Germans had six armoured divisions, four light divisions,

“GERMAN ARMOURED FORCES HAD GONE TO WAR USING A STOP-GAP SOLUTION”

each with their own tank battalion, and four fully motorised divisions without tanks. When they were unleashed in Poland in the autumn of 1939, their success was referred to as blitzkrieg (lightning war) in both the Allied press and by German propaganda. The concept of mobile warfare continued to be developed along with technology. The early German tanks were not the best for the tasks they were put to, and their commanders were forced to improvise. Of almost 3,000 tanks, most were Panzer I and II. There were fewer than 200 Panzer IV tanks and 100 Panzer IIIs. Essentially, the German armoured forces went to war using a stop-gap solution. 🇸🇪

Harald Sonesson is a reserve officer with a tank background. **Marco Smedberg** is a lieutenant colonel in the reserves and a military historian.

Further reading: **Tanks in Battle** (1965) by HCB Rogers ★ **Tank Men – the Human Story of Tanks at War** (2008) by Robert Kershaw ★ **The Tank on the Battlefield** (2010) by Patrik Axelsson and Richard Areschoug.

HEINZ GUDERIAN

Headstrong General wins blitzkrieg

Heinz Guderian was a driving force in the development of German panzer (armoured) forces. His refusal to follow orders led Germany to **victory in France in 1940**. Niklas Zetterling exposes a stubborn commander, almost unique in war history.

Heinz Guderian, commander of Panzer Group Guderian, at Baturin in Ukraine in September 1941. He is sitting in a SdKfz 251/6 command tank.

SCHERL/SZ PHOTO/BL

Heinz Wilhelm Guderian

Born: 1888 in Kulm, West Prussia.

Death: 1954 in Schwangau, Bavaria.

Career: Colonel 1933, Lieutenant General 1938, General 1938, Colonel General 1940.

Awards: Included Iron Cross (1st and 2nd Class), and Knight's Cross with Oak Leaves.

Publications: In 1937, the now-famous book *Achtung – Panzer!* was published, which became the doctrine for German mobile warfare.

Quote: "There are no desperate situations, there are only desperate people."



**Knight's Cross
from 1939.**



In September 1939, Guderian's XIX Army Corps invaded Poland in Panzer I and Panzer IIs. Heinz Guderian was probably in the command tank on the right. Here he demonstrated his conviction that a commander should lead from the front.

The tanks' line of fire was obscured in the heavy morning mist on 1st September, 1939. As Heinz Guderian drove his armoured vehicle towards the front, his thoughts were preoccupied by what a tank commander's role might be in the war. Modern communication equipment allowed him to contact both his staff and the subordinate units that he'd yet to link up with.

During a war, it's not possible to prepare for every eventuality, however. Guderian followed the 3rd Panzer Brigade closely as it invaded the Polish Corridor. Suddenly a German artillery shell landed 50 metres in front of his vehicle, exploding with a fierce bang. Guderian had barely recovered before another shell exploded, this time 50 metres behind him. Convinced that the next would be a direct hit, Guderian ordered his driver to turn around. The nervous soldier, however, drove into a ditch, causing irreparable damage to the vehicle's steering. The general was forced to head back on foot, ducking and diving to avoid being hit by his own artillery.

This was Guderian's introduction to World War II. It was a little humiliating, but in accordance with his philosophy, his divisions continued the offensive



Guderian wrote articles on tanks in magazines such as *Militär wochenblatt*. This edition is from 1912.

while Guderian walked back to his corps command post, making sure to pass on an acerbic comment to the artillery as he passed.

Heinz Guderian was born in West Prussia in 1888, son of Second Lieutenant Friedrich Guderian and Irtha Ottilie Clara Kirchhoff. When he was 12, Guderian was sent to a military cadet school in Karlsruhe. Seven years later, he'd attained the same rank his father had held when he was born. During World War I Guderian served as a communications officer and commander of a radio station, which contributed to his knowledge of radio communications and the importance of commanding divisions without relying on the wired connections that had been dominant during WWI.

After 1918, Guderian became a general staff officer in the Iron Brigade – later known as the Iron Division – and fought against Soviet forces in the Baltics. He subsequently served in the Reichswehr – the limited German army that was permitted under the terms of the Treaty of Versailles.

During the interwar period, his interest in armoured warfare grew. He read most published works and participated in debates, including writing

“Guderian showed resourceful thinking when leading his divisions”

articles in magazines such as *Militärwochenblatt*. His role in the development of German armoured warfare has often been stressed, but it should not be overstated. Other officers, such as Colonel Oswald Lutz and Lieutenant Ernst Volckheim, were more prominent in its development.

Since Germany did not have permission to possess its own tanks, Guderian's first contact with this type of weapon was in Landskrona, Sweden in 1929. Here he briefly drove a Stridsvagn m/21-29 produced by Swedish arms manufacturer Landsverk, which had been involved in developing early German tanks. Back in Germany, Guderian could only take part in dummy exercises with various models that mimicked armoured vehicles and tanks.

In the 1930s, Guderian played an increasingly significant role in developing Germany's armoured divisions, partly due to the expansion of the armed forces, which led to better career opportunities. He was promoted to Colonel in 1933 and had then held important positions within the General Staff's Motorised Troops Command Staff.

In 1933, Hitler witnessed a motorised troops demonstration organised by Guderian. The Nazi leader was impressed by what he saw, but while it's difficult to judge how much this specific incident particularly influenced him, it certainly helped promote a positive image of both armoured warfare and Guderian to the German dictator. In any case, Guderian's career continued to gain momentum. He continued to promote and write about armoured divisions, and when the first three German panzer divisions were created in 1935, he took command of the 2nd Panzer Division.

During the latter half of the 1930s, Guderian's star rose. In 1938 he was appointed lieutenant general and put in command of XVI Corps, which commanded all three panzer divisions. At this time, the danger of another European war loomed large. In the summer of 1939, it became quite clear that a German invasion of Poland was imminent. In preparation for this, XIX Army Corps was created, and Guderian then became its commander.

When war broke out on 1st September, Guderian spearheaded the invasion with XIX Army Corps from Pomerania and entered the Polish Corridor, which separated East Prussia from the rest of Germany. He needed to reach East Prussia quickly, regroup in the east and advance towards Brest-

Litovsk in eastern Poland. The city fell on the evening of 16th September.

During the campaign in Poland, Guderian showed resourceful thinking when leading his divisions and achieved significant progress. The September campaign can be seen as practical confirmation for his thoughts on how the divisions should be trained, organised and equipped. He'd long advocated the importance of good radio contact, that the commander should lead from the front and that mobility was a weapon in itself. He'd also personally led his divisions during the Polish campaign, and the majority of other German officers imitated his leadership style. Guderian, however, was exceptionally faithful to this hands-on approach. This would become even more evident the next time he led his troops in the field.

On 10th May, the Germans launched a major attack on Western Europe. Its purpose has been the subject of much speculation. Since the operation was crowned with perhaps the most overwhelming victory over a superpower in modern history, it has been tempting to conclude that the German aim was always to take out France in a blitzkrieg. However, modern research questions this picture. Most suggest that Hitler launched the attack on the Western powers without expecting much progress. Instead, he hoped to occupy Belgium and the Netherlands, which would give the Luftwaffe good bases for attacks on ports, industries and communications networks in Britain and France. In addition, enemy aircraft would have greater difficulty attacking targets in Germany if German ground forces advanced as far as the English Channel.

Similarly, most senior German commanders didn't appear to have foreseen the swift collapse of the Allied defences, while few neutral observers believed that a German victory would follow so quickly after the campaign began. One important reason for this assessment was that the balance of power was not in the German's favour. In addition, the Allies appeared to be well-prepared for a confrontation and well-located in positions, many of



Guderian in a half-track SdKfz 251/6, which he used as his mobile command centre in France, 1940. In the foreground is the Enigma encryption machine.

BUNDESARCHIV, BIL.D 1011-769-0229-12A

HEINZ GUDERIAN

► which were strongly fortified. Most of the German force was part of Army Group B, which assembled between the North Sea and a line between Cologne and Liège, and Army Group A, which was grouped south of the Cologne-Liège line to the point where the borders between Germany, Luxembourg and France met.

Army Group B attracted the Allies' attention, but it was Army Group A who took the lead. Most of the German armoured and motorised divisions operated through Army Group A. General Hermann Hoth's XV Army Corps including two panzer divisions would advance over the River Meuse around the Belgian city of Dinant.

Further south, General Georg-Hans Reinhardt's XXXXI Panzer Corps would cross the Meuse at Monthermé. This corps also consisted of two armoured divisions. It was decided to place Guderian's XIX Army Corps on Army Group A's southern flank. With its three armoured divisions and the elite Infantry Regiment Grossdeutschland, it was stronger than all the other German corps and would play a critical role in the campaign.

The town of Rouen in Normandy was almost completely destroyed during the German invasion in 1940.

When Guderian received his orders, there were no objectives or detailed instructions for what to do after the bridgehead over the Meuse had been captured. Guderian, however, set his target considerably further west, namely the English Channel coast. For him, the river crossing at Sedan was just a stepping stone and it was an approach he kept hold of, no matter what his superiors thought. Initially, Guderian's corps advanced through

Luxembourg and the south-eastern region of Belgium. The most significant resistance came from roadblocks and destroyed roads. Most of the German invasion force's advance ran smoothly, and Allied air forces failed to slow down Guderian's divisions. When XIX Corps approached Sedan from the north and east, the Luftwaffe would support Guderian's ground forces when crossing the River Meuse. The close air support would be provided by II Air Corps, led by Lieutenant General Bruno Loerzer, and Guderian had agreed with him that the air support would be continuous, but with moderate intensity during the operation. At the same time, orders from Army High Command arrived to launch a massive air raid against the French positions at Sedan before German troops embarked on crossing the river.

Neither Guderian nor Loerzer considered this a good move, so pretended that the new order had come too late, following their initial plan instead. It turned out that disregarding orders worked to their advantage. Aircraft were not the best way to take out ground forces, although they were effective at restricting enemy activity. It also appeared that the air strikes had taken out many French telephone lines, which was crucial because the French had little in the way of wireless radio communications and relied on a top-down command structure. This was just one of several examples of how Guderian – in this instance with Loerzer – deliberately went against the orders of his superiors to drive progress on the battlefield.

Guderian's corps crossed the Meuse at Sedan faster than expected. One explanation for his rapid progress may have been the close air support. Most experts suggest that it was a factor, but far from the most important. It turned out that the two corps in the north, XXXXI and XV, were equally successful despite the fact that they met their objectives without any significant support from the Luftwaffe.

Some factors were, however, common to the three corps: all three had decentralised decision-making, the armoured divisions were resourceful, radio communications were good and, not least, the officers and crews were well-trained and well-prepared. These were all things that Guderian had fought to accomplish.

Guderian's means of responding to the orders and intentions of his superiors became even more evident over the following week. His corps quickly established a bridgehead on the west bank of the Meuse, and Guderian saw an immediate opportunity to move west. This, however, was not something the OKH (*Oberkommando des Heeres* – German Army High Command) was prepared for. In spite of this, ►



HULTONARCHIVE/GETTY

Breakthrough at Sedan

★ On 10th May, 1940, most of the German armoured forces were grouped in the south on the Cologne-Liège line.

There were Guderian's three panzer divisions, which attacked Sedan (bottom arrow), and Georg-Hans Reinhardt's two panzer divisions (second arrow from bottom).

Hermann Hoth's two panzer divisions attacked the River

Meuse a little further north in the direction of Dinant.

Guderian's XIX Corps, consisting of the 1st, 2nd and 10th Panzer Divisions and the elite infantry regiment Grossdeutschland (under the 1st Panzer Division), played a central role and after a record-quick breakthrough at Sedan, they moved further west towards the coast, against orders of German High Command.

XX Panzer Division
 ■■■■ Maginot Line



**“For him [Guderian],
 the river crossing
 at Sedan was just a
 stepping stone”**



A German Panzer 38 (t) under the command of Guderian and Rommel waits to cross the River Meuse in May 1940.

A German Dornier Do 17Z light bomber on its way to Sedan to support Guderian's infantry forces as they cross the River Meuse.

► the headstrong general chose to continue, making room for subsequent divisions along with General Gustav von Wietersheim's motorised XIV Panzer Corps. Despite receiving a direct order to cease his advance, Guderian managed to get permission to continue the attack for 24 hours. During the day his forces moved westward as fast as they could possibly travel.

The OKH saw what Guderian was doing and instructed his direct superior, General Ewald von Kleist, to order a halt. By this point XIX Army Corps had advanced 120 kilometres west from Sedan while XXXXI and XV Corps moved forward to the north. Guderian was furious. He knew that there was only 100 kilometres left before reaching the Channel coast and demanded to be relieved of his command. Taken aback, von Kleist nevertheless accepted. The halt order had probably come from Hitler himself – as von Kleist seemed to be of the same opinion as Guderian, but in this instance he was forced to be the bearer of bad news. One indication of this is

that a few days earlier von Kleist had been ordered to stop Reinhardt's XXXXI Corps in the same way. On that occasion, the general pretended that the order had arrived too late.

If the commander of 12th Army, Colonel General Wilhelm List, had not intervened, the situation might not have been resolved. He flew to see Guderian and persuaded him to continue as the corps' commander, allowing him to carry out "reconnaissance in force".

Guderian accepted the proposition readily. He ordered his divisions to head west as soon as possible, but banned them from using radio in case the transmissions were intercepted by the OKH. Instead, communication was to be exclusively through wired connections. In this way, the Guderian kept his actions hidden.

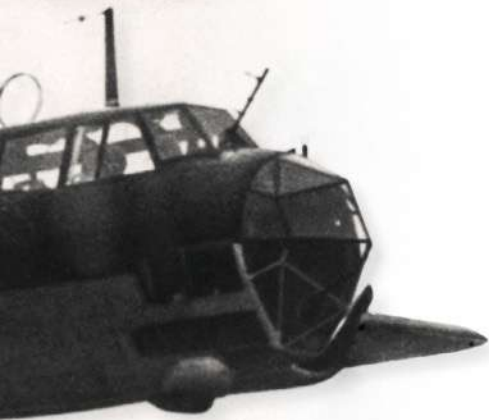
On 20th May, he reached the Channel coast without any further obstruction from his superiors. This effectively completed the operation, although it wasn't clear to everyone at the time. The Allied troops were now surrounded, either forced to surrender or flee across the sea to Britain, abandoning their vehicles and equipment.

On 5th June, the Germans launched an attack on the remaining French units. For this operation, Guderian's XIX Army Corps was subsumed into the newly created Panzer Group Guderian, which comprised two corps. The German units, not least those under Guderian's leadership, completed the operation quickly, forcing France to surrender.

Guderian consistently ignored the OKH's decisions while defeating the French troops ahead of him – a scenario extremely rare in the history of warfare. Guderian did this with a leadership style that became his hallmark and with troops that he had helped to develop. The latter is worth emphasising because the Germans did not possess numerical superiority. The quality of weaponry, vehicles and materiel varied on both sides. On



French PoWs in the Sedan area in 1940. In total, Germany took around two million prisoners during the campaign.



Forces numbers 1940

PERSONNEL (Army)

Total
At the Western Front

TANKS

Total
At the Western Front

ARTILLERY

Total

PLANES

Total number of aircraft
At the Western Front *

*only battle-ready planes

France	Belgium	Netherlands	Great Britain	Germany
5,500,000	640,000	400,000	1,600,000	4,200,000
2,240,000	640,000	400,000	500,000	3,000,000
4,111	270	40	unknown	3,505
3,254	270	40	640	2,773
10,7	1,338	656	1,280	7,378
3,097	140	82	1,150	3,578
879	118	72	384	2,589

the other hand, German troops were trained to act faster with greater initiative and fought more effectively than the Allies.

Hitler's biggest operation was Operation Barbarossa – the invasion of the Soviet Union on 22nd June, 1941. This time, planning revolved around panzer troops playing the main role from the very beginning. Virtually all German panzer divisions were divided into four armoured groups. Of these, Army Group Centre was given the two most powerful. This army group was tasked with advancing on Moscow.

Guderian had been given command of Panzer Group 2, who fought on the southern flank of Army Group Centre. It constituted, together with General Hoth's Panzer Group 3 on the northern flank, the most important battle force among all the German troops who invaded the Soviet Union. The two groups possessed around 1,000 tanks each. Hoth and Guderian moved quickly

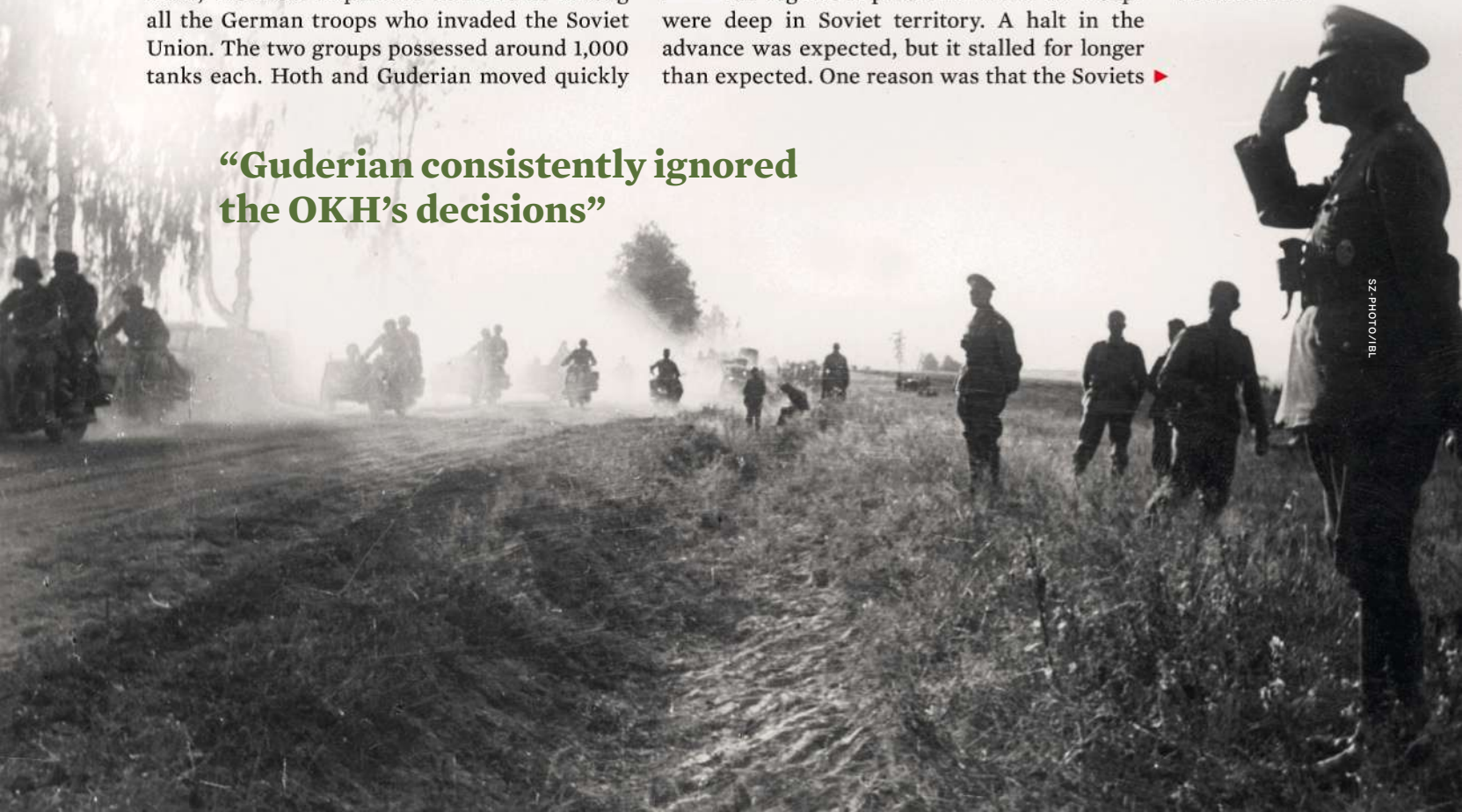
through Belarus. After six days, Guderian's troops had travelled 450 kilometres into Soviet territory, which meant he could start preparing to cross the River Dnieper. Along the way, Guderian and Hoth had surrounded and subjugated a large number of Soviet troops, including substantial armoured forces. The operation's success even exceeded that of the blitzkrieg in 1940.

The German advance continued. Guderian crossed the Dnieper near Mogilev and captured Smolensk on 16th July. By now he'd travelled more than two-thirds of the distance between the border and Moscow. So far, the German offensive had gone smoothly, but problems lay ahead.

Even at the planning stage it had become clear to the Germans that there would be logistical problems when its troops were deep in Soviet territory. A halt in the advance was expected, but it stalled for longer than expected. One reason was that the Soviets ▶

Eastern Front 1941. Guderian, commanding Panzer Group 2, greets motorcycle infantry in the Soviet Union.

“Guderian consistently ignored the OKH's decisions”



HEINZ GUDERIAN

► possessed considerably larger reserve forces than the Germans had believed.

For Guderian, the objective was crystal clear: he would get to Moscow as soon as possible. It was an opinion he shared with the majority of his officers.

They believed that Soviet reinforcements would be sent to Moscow where the Germans would fight against the enemy's main force and defeat it.

This view was at odds with Hitler's aims, which were economic. The Führer's goal was to take Leningrad, plus capture the rich agricultural areas of Ukraine as well as the oil fields in the Caucasus. In part he wanted to make sure that Germany could get grain and oil (which the Germans lacked), which would in turn deny them to Stalin. Therefore, he wanted Panzer Group 2 to head south while Hoth's Panzer Group 3 was ordered north to Leningrad.

Guderian did what he could to prevent this, deploying his troops so that it would be difficult to send them anywhere other than Moscow.

In fact, Hitler's thinking was illogical. Economic factors were admittedly extremely important, but he wanted rapid progress and economic elements are usually a more long-term objective. The

solution that Guderian advocated was better placed to deliver a decisive outcome in 1941. However, the disagreement wasted precious time and when Hitler forced through his demands, Guderian had to quickly redeploy his panzer group.

Guderian remained opposed and on 23rd August flew to see Army Group Centre's commander, Field Marshal Fedor von Bock, to discuss how this could be avoided. In the afternoon they flew to Rastenburg to try to persuade Hitler to change his mind. This failed and on the morning of the 24th, Guderian ordered his troops to change their attack direction and instead go directly south. On the same day, Panzer Group 2 broke through Soviet defences. On the evening of 25th August, it had advanced 120 kilometres into Soviet territory. The flexibility shown by Guderian's troops was incredible. The move into Ukraine was a tremendous success, and no fewer than 663,000 Soviet soldiers were captured in a gigantic pincer movement. But at the same time, the attack on Moscow had to be postponed by one month.

On 30th September, however, Guderian was able to change direction to the north-east, and two days



GALE RIEBOLD/GETTY

Operation Barbarossa launched at 16.45 on 22nd June, 1941. A Tauchpanzer III amphibious vehicle from the 2nd Panzer Regiment in the 18th Panzer Division crosses the River Bug.

“For Guderian, the objective was crystal clear: he would get to Moscow as soon as possible.”

later other parts of Army Group Centre joined the attack. Guderian moved forward with exceptional speed and reached Oryol in just four days as other troops in the army group also made good progress.

Within two weeks, most of the Soviet forces that defended the areas west of Moscow were surrounded. The Germans took over 670,000 prisoner and the road to the Soviet capital was open. By now, however, the autumn rains had set in and transformed the ground to mud, which stopped the German troops.

The mud provided Stalin with a respite, which he fully exploited to bring in reserves. By the time the ground was hardened by the cold, he'd both plugged the front and deployed his fresh troops for a counterattack.

The associated risks were exposed when the Red Army launched a counteroffensive on 6th December. It could be met either by a mobile defence or static one where troops would dig in and hold their positions for as long as possible.

Guderian naturally advocated the former, and when he again defied the orders he received, was relieved from command. Thus he was no longer leading his troops into battle.

For more than a year, Guderian was left in the German reserves. During this period, the fortunes of war turned against the Germans. In the winter of 1942–43, the Germans suffered a catastrophic defeat at Stalingrad, which probably contributed to his recall by Hitler.

On 1st March, he took on a new role as Inspector General of Armoured Troops, which also provided an opportunity to steer the development of new tanks and troops.

However, from 1943, Germany's situation had become hopeless. It might not have been obvious to everyone at this time, but the Allies' industrial and personnel resources were so superior that the end of the war was inevitable – not least with regard to tank production.

Admittedly, Guderian did all he could to increase German production, but the Allies' superior access to industrial plants, raw materials and labour meant they had a much greater advantage and were much quicker to respond. Germany's increasingly desperate situation led to several assassination attempts on Hitler.



TIME & LIFE PICTURES/GETTY

On 20th July, 1944, the most famous attempt was made, but Hitler survived and took revenge on the conspirators. The following day, Guderian was appointed the OKH's Acting Chief of the General Staff, a post that had once been very important.

By this time, however, Hitler had completely taken control of military operations, so in practice the chief of staff was little more than a counsellor. Guderian was, as usual, quite direct with his opinions. He was headstrong and often opposed Hitler. Yet he was tolerated by the Führer until March 1945, when he was fired again. He wasn't ever given a new position.

The Germans surrendered in early May 1945, and on 10th May, Guderian was captured by the Americans. He was released in 1948 and became an adviser when the West German defences were reconstructed in the 1950s.

Guderian wrote his popular memoirs in 1950. In *Panzer Leader*, he unsurprisingly focused on his role in the development of German armoured warfare, while trying to downplay any involvement of the armed forces in the crimes of the Third Reich. On the other hand, his description of what actually happened during the military operations seems credible.

Undeniably, Guderian had lived an eventful life by the time he died in 1954 at the age of 65. His influence on the design of German Panthers was significant, but there were many other officers involved in the process. Guderian's role was perhaps most prolific during the campaign in the west in 1940, but his ability as a general was also showcased during Operation Barbarossa. 🇩🇪

Supreme commander of the Luftwaffe, Hermann Göring, Adolf Hitler and Heinz Guderian study the plan for the upcoming Ardennes Offensive in Belgium between December 1944 and January 1945.

Further reading:
The Blitzkrieg Legend (2013) by Karl-Heinz Frieser. ★
The Breaking Point, Sedan 1940 and the fall of France (1990) by Robert A Doughty.

KV-1 and KV-2

STALIN'S STEEL

When the Germans shot at the KV tanks during Operation Barbarossa, their shells bounced off its thick armoured hull. Yet the Soviet Union's **45-tonne tanks** could easily take out a Panzer IV from over a kilometre away.

Text: **CHRISTER BERGSTRÖM**

Even the concentrated fire of the artillery and all the other heavy weapons his troops possessed did not deter the steel pachyderms. Though enveloped in fire and smoke, they immediately lumbered to attack, crushing everything in their paths. Untroubled by the shower of howitzer shells and debris raining down upon them, they attacked a roadblock, shrugged off the flanking fire of our anti-tank guns in the woods, turned and overran those positions, and then broke into the artillery area.

This was how General Erhard Raus, Acting Commander of the German 6th Panzer Division, described the division's first encounter with the terrible KV tanks on 24th June, 1941, the third day of Operation Barbarossa – Hitler's invasion ►

The KV-2 was equipped with a 152-mm howitzer.



**"THEY ATTACKED...
CRUSHING EVERYTHING
IN THEIR PATHS"**

MONSTERS

A column of KV-1S from the 6th Panzer Division rolls towards the front in 1943. The KV-1S was a modified version of the KV-1, which, among other changes, reduced armour thickness to be faster.



Thin German armour

★ Superior KV, p28



Early use of diesel engine

★ Fuel-efficient KV, p31



Tank under scrutiny

★ Great graphics KV, p32

STALIN'S STEEL MONSTERS

► of the Soviet Union. The Soviet counterattack came as a total shock to the Germans.

The enormous KV tanks – named after the Soviet Defence Minister Kliment Voroshilov – ploughed through everything in their way.

Around 100 German tanks were ordered forward and attacked from three sides. But their shells just bounced off the KV tanks, which then blasted one German tank after the other.

With German soldiers fleeing in panic, the enormous steel monsters rolled on. At one point, a German tank became stuck in a small marsh. 45 tonnes of heavy KV tank simply rolled straight over it with its wide caterpillar tracks and crushed the German vehicle into the bog.

IT WAS ONLY when German air support and 88-mm FlaK guns from the Luftwaffe arrived that the Soviet tanks could be fought. Some were taken out by the heavy anti-aircraft guns and many others were abandoned by their Soviet crews when they ran out of ammunition and fuel. But one of the KV tanks broke through into the middle of German forces. It assumed position on the only road German supplies could come through. A column of 12 German trucks were shot to smithereens and left burning on the road as a warning sign to other German vehicles.

Commander Raus sent out a unit with 50-mm anti-tank guns to try to neutralize the KV tank. The



The 1940 KV-1 tank model was manufactured at the Chelyabinsk Tractor Factory, east of the Ural mountains from 1941.

Below: A German Panzer III from the 10th Panzer Division awaits orders. In a confrontation with a KV, these German tanks had no hope.

artillery crews fought their way through a forest in order to deliver a surprise attack and assumed a position at a distance of 600 metres.

A shell struck the KV, followed by another. But nothing happened – the KV remained undamaged and in position. Not until at least eight shells had bounced off its thick chassis did the turret finally begin to rotate. The Soviet tank commander carefully aimed then fired. An anti-tank gun was torn apart. The KV crew then slammed another



Thin German armour was useless against KV

★ Germany's best tanks in 1941, the medium-heavy Panzer III and Panzer IV, were no match for the Soviet KV. The frontal armour on both German tanks was only one third as thick as on a KV: 30 mm against approximately 90 mm (depending on your source). The KV could take out any German tank in 1941 from more than two kilometres away, while the German tanks were

forced to come up close behind a KV to have any chance of beating it.

In spite of its weight, the KV-1 tackled soft surfaces better than the German tanks. The KV-1 had a ground pressure of only 0.7 kg per square centimetre, while the German Panzer III had a ground pressure of 0.9 kg per square centimetre despite being less than half the KV-1's weight. This

superiority came partly from its wide caterpillar tracks (65 cm compared to 35 cm on the Panzer III) and partly from a torsion-bar suspension that connected to the 12 drive wheels.

One key advantage the German tanks enjoyed was that all were equipped with two-way radio, while only the Soviet command tanks were able to transmit.

round into the main gun and another anti-tank gun was wiped out. Methodically, the Soviet tank commander destroyed all the German guns. The supply route remained blocked.

That afternoon, an 88-mm anti-aircraft gun was released from the fighting at the bridgehead and brought to bear on the KV. The Soviet commander saw the 88-mm gun coming closer and closer, but waited for the right moment before striking. The whole tank crew waited, knowing that the 88 could only open fire after it had stopped.

SUDDENLY, THE 88-MM GUN halted and its crew prepared to fire. We'll never know what the Soviet tank commander was thinking at that moment. Maybe he smiled in triumph, perhaps he cursed the fascist invaders. But the turret rotated and the 76-mm gun locked on to its target. With a powerful flash of light, the 88 was destroyed and the surrounding area was peppered with machine-gun fire from the tank.

At the isolated bridgehead, the morale of the soldiers in the cut-off section of the German 6th Panzer Division began to drop. During the night, 12 volunteers tried to destroy the tank with a powerful explosive charge. Under the cover of darkness, they crept towards it and placed the charge. Then they retreated into the woods and lit the fuse. The stillness was broken by a violent explosion and a

“SHELLS JUST BOUNCED OFF THE KV TANKS”

huge flash of light between the dark trees. A violent clatter from the tank's machine gun showed that the KV was still very much alive.

ON THE MORNING of 25th June, the Germans tried to persuade the Luftwaffe to bomb the tank, but the request was rejected. The planes were needed elsewhere. The by-now hungry Germans had to come up with a new plan to neutralise the life-threatening force that was this “super tank”. This time they staged a combined operation.

Since the woods were quite sparse, small German Panzer 38(t) tanks were able to advance to a firing position near the KV. By hiding behind bushes, trees and small knolls they crept forward until they could open fire on the Soviet tank.

Of course, the 37-mm guns were completely incapable of inflicting damage on the tank, but the repeated hits startled the Soviet tank crew and crucially distracted them. The KV started shooting back at the irritating tanks. Once the Soviet tank crew was distracted, the Germans ►



STALIN'S STEEL MONSTERS

- ▶ positioned a new 88-mm anti-aircraft gun behind the steel colossus.

The anti-aircraft gun's crew shot seven shells, and each one was a direct hit. The tank shook violently, and the rotation system of the turret seemed to jam. Then German combat engineers rushed forward and dropped hand grenades into a breach in the turret. There was a muffled bang inside the tank and the turret's hatch flew into the air. Then everything was silent.



When a German combat engineer cautiously peered through the open hatch, he was greeted by the gory sight of the crew's bloody remains, little more than bits and pieces.

Deeply impressed by their courage, the Germans buried them with full military honours. An inspection of the KV showed that of all the shells that had been fired at it, only two of the last seven – fired by the 88-mm gun at close range – had managed to penetrate its armour.

A KV-2 commandeered by the German army. It went by the name (Sturm) Panzer Kampfwagen KV-II 754 (r) when operating as part of the German army.

HITLER'S INVASION OF the east in 1941 was based on a catastrophic underestimation of the Soviet Union's military capability. The most serious issue was that the Germans had failed to spot information about the existence of the new Soviet T-34 and KV tanks. They'd believed the Red Army had only obsolete tanks that were inferior to the German models.

It is true that most of the Soviet armoured forces in 1941 consisted of small and lightweight

"THEY [GERMANS] BELIEVED THE RED ARMY ONLY HAD OBSOLETE TANKS"

T-26s, easy prey for the German tank crews with their thin armour and lightweight weapons. That was also the main reason for the Soviets' apocalyptic vehicle losses in 1941 – which amounted to over 20,000 tanks.

BUT SOVIET INDUSTRY had also developed two new tanks that were the best in the world at that time. The fact that the German intelligence service had missed this development was inexcusable.

The medium heavy T-34 is the best known of these new tanks. With its wide, steel tracks, powerful, sloping frontal armour and effective 76-mm gun, it became the archetype for all tanks developed since. The T-34 was launched in 1940 and became the most widely produced tank of World War II, with nearly 65,000 models manufactured.

Less well known is the heavy KV, of which just over 3,000 units were produced. But it seems certain



that the KV was the one that scared the Germans most when they attacked in the summer of 1941.

With thick frontal armour of around 90 mm, the KV was virtually impenetrable to all German anti-tank weapons. If they did not have special armour-piercing shells, then the 50-mm anti-tank guns – the best the Germans had against enemy units in 1941 – were only effective against the KV at close range – a few tens of metres. It was probably only the 88-mm anti-aircraft guns that could effectively tackle these beasts, but as the German tank general Heinz Guderian noted, even their shells often simply bounced off the KV's sloped frontal armour.

IN JUNE 1941, the Red Army had 471 different KV tanks, one-third of which were huge, 52-tonne KV-2s. These mammoth tanks had a massive 12-tonne turret mounted with a 152-mm howitzer and were designed to destroy enemy bunkers and other fortifications.

In addition to nearly 500 KVs, there were more than 800 T-34s at the time of the German attack in June 1941. Both of these tanks were so far ahead of their enemy's machines that if it had not been for the Germans' air superiority, it is highly possible that they would have halted Hitler's invasion. But with their control of the skies, German aircraft could effectively cut supply lines to any Soviet armoured forces that broke through the German front.

Throughout the day of 24th June, 1941, the Soviet 28th Tank Division was unable to move anywhere, due to a fuel shortage caused by German air strikes. The commanding officer, Major General Ivan Chernyakhovsky, called the staff of the 10th Army in desperation. His men were fighting bravely, but their tanks were helpless without fresh supplies of both fuel and ammunition.

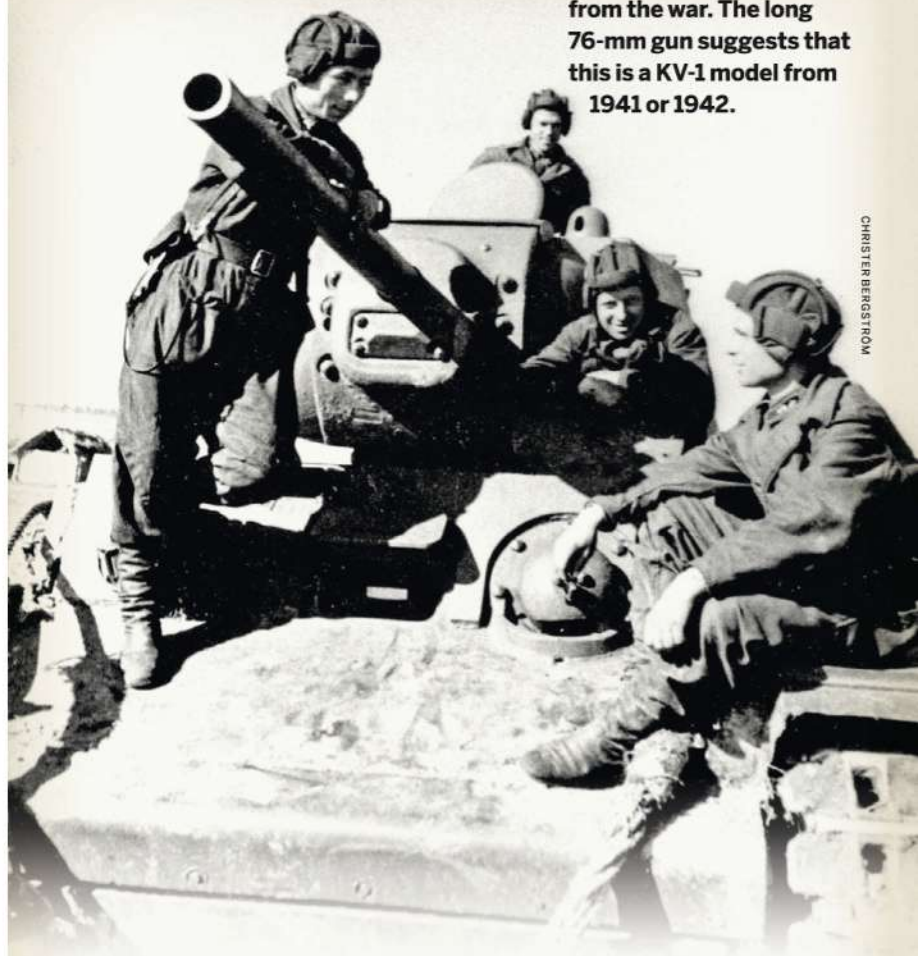
WHEN THE BATTLE was over, the 28th Tank Division had abandoned 198 tanks. The Germans found the sight of all these steel carcasses overwhelming as they advanced through the battle area. Of 1,596 KV tanks put into service in 1941, two-thirds were lost, the majority because of empty fuel tanks. But before they were lost, the KV tanks had often succeeded in inflicting heavy casualties on their opponents.

On 15th July, 1941, the German 8th Panzer Division of General Erich von Manstein's LVI Panzer Corps was on its way to Ilmen Lake about 200 kilometres south of Leningrad (modern-day Saint Petersburg) when the Red Army without warning, suddenly counterattacked.

If the 128 lightweight T-26s had been the only armoured vehicles there that day, it would not have caused much of a problem for the Germans,

Article continues on page 34 ►

A KV-1 crew takes a break from the war. The long 76-mm gun suggests that this is a KV-1 model from 1941 or 1942.



CHRISTER BERGSTROM

Lightweight diesel engine saved fuel

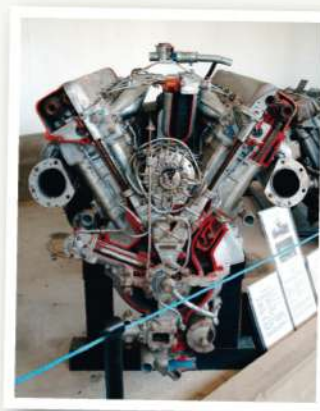
★ The engine of the KV – and for the majority of Soviet tanks during World War II – was virtually unique. It was a 12-cylinder diesel engine, referred to as a V-2 (or V-2K in the KV's case). All the other major powers in the war in Europe had petrol engines.

Diesel engines are significantly more fuel efficient than petrol engines. The 45 tonne KV-1 used on average only 1.8 litres of fuel per kilometre when travelling by road, while the 21-tonne Panzer III used over two litres to travel the same distance.

An early issue with diesel engines was that they tended to be big and heavy compared to their power output; petrol engines were lighter and more powerful.

But Konstantin Chelpan, the engineer who developed

the V-2, managed to produce a diesel engine with a specific weight of only 1.25 kg per unit of horsepower, compared to the 1.6 kg per unit of horsepower of the Panzer III's Maybach petrol engine.



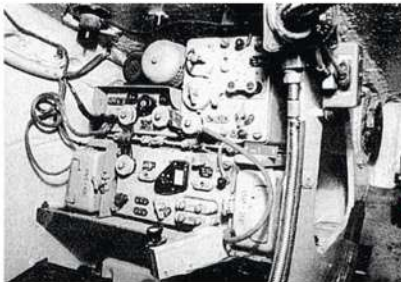
V-2 engines were used both in the KV tanks and in the famous T-34. This version was in the latter.

KV-1

A total of 3,015 KV-1 tanks were built between 1940 and 1942. With its thick armour and powerful gun, it was superior to all German tanks on the battlefield at that time. Below is a KV-1 1941 model as it was equipped during the 1942 battle.



View towards the turret. The gun is in the middle. On side are the gunner's and tank commander's periscopes.



View towards the front. The radio operator's seat (hidden in the picture). He sat to the left of the driver and handled the front machine gun.

KV-1 M1941

Dimensions: Length: 6.75 m, Width: 3.32 m, Height: 2.71 m.

Weight: 45 tonnes.

Engine: V-2K four-stroke diesel, V-type.

Engine power: 41:600 hp

Weapons: 76-mm gun, Three built-in 7.62-mm machine guns.

Top speed: 34 km/h on the road, 16 km/h on open ground.

Maximum range: 335 km.

Fuel consumption: 1.79 l/km.

Antenna Commander's tanks had both transmitters and receivers for radio communication. The other tanks only had receivers.

Gun The main weapon of the 1941 KV-1 model was a 76-mm modified F-34 gun, known as the M1941 ZiS-5.

Shield to protect the weak points at the base of the gun.

Machine Gun DT 7.62-mm. This fired in parallel with the other machine gun (hidden behind the barrel).

Periscope for aiming the main gun.

Angle of elevation control

Viewing Periscope with reinforced glass

Machine Gun DT 7.62-mm (hidden).

Driver

Ammunition Storage for the 7.62-mm machine gun ammunition.

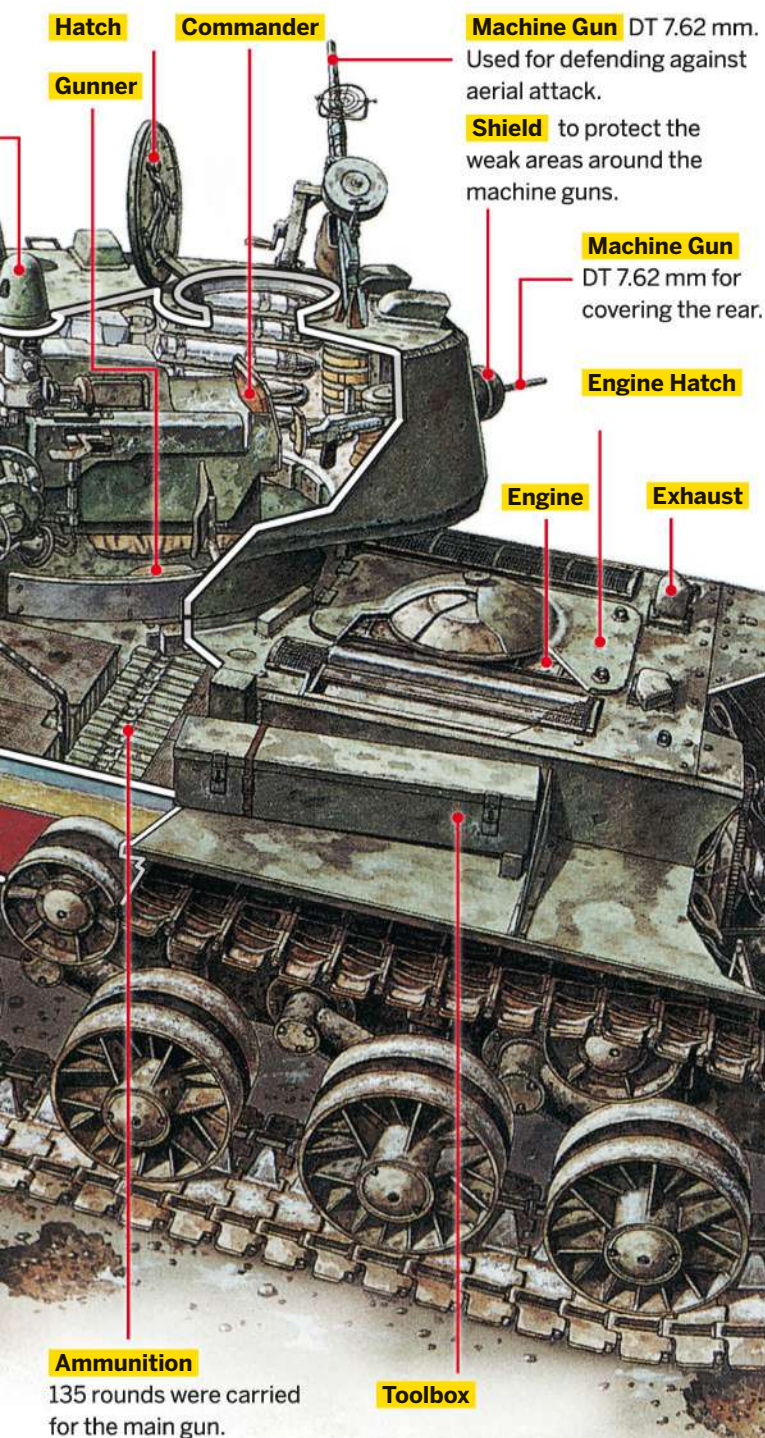
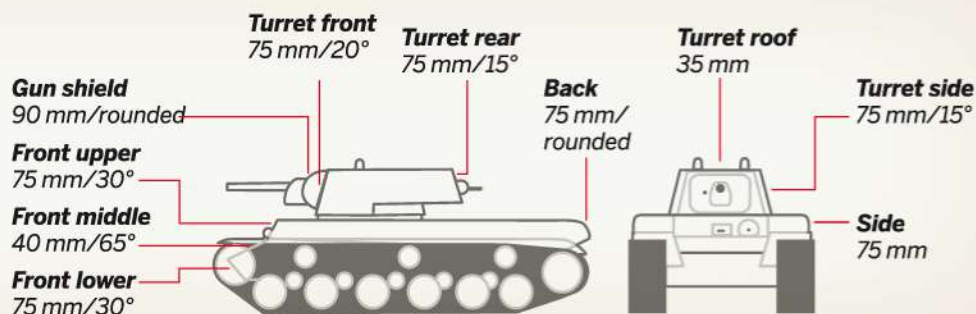


A captured KV-1 with German caterpillar tracks. The original tracks would have been almost twice as wide.

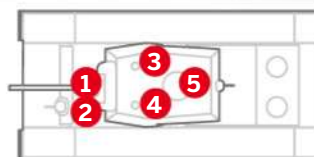
Fuel tank Capacity 135 litres. With another tank on the right side the tank could carry 600 litres of diesel in all.

Thick and sloping bonnet

★ The 1940 KV-1 was the most common model used at the beginning of Operation Barbarossa. Sloping front armour provided better protection than its thickness suggests. The side armour was more vulnerable.



The crew:
driver (1), radio operator (2), tank commander/loader (3), gunner (4) and driver/mechanic (5).



Gearbox hatch

Gearbox

Five forward, one reverse gear.

Drive wheel

German advance stopped dead

★ 19th August, 1941. Lieutenant Kolobanov took out 22 German armoured vehicles outside Leningrad.

■ KV-1 ■ German vehicle

1 Kolobanov's group waited in a wooded area with good views of the road.

2 When the Germans approached, Kolobanov took out the two leading vehicles, blocking the road.

3 He then crippled the last vehicle so the escape route was cut.

4 He then picks off the convoy, one by one.

A swamp prevented the Germans from leaving the road.

► but the Red Army was supported by a handful of KVs. In a short time, the KV's knocked out 39 tanks and ploughed straight through the German lines. The Soviet infantry followed, and before von Manstein knew it, his entire panzer division had been surrounded; the advance had been turned into a desperate defence.

The Germans saved von Manstein's force by inserting a second panzer corps, but the 8th Panzer Division had lost 70 tanks, and the tank crews were so demoralised that the entire force had to be withdrawn temporarily from the fighting.

SOLDIERS FROM THE 8th Panzer Division were again exposed to the ruthless effectiveness of the KV tanks when they were redeployed to the front line for what was supposed to be the final attack on Leningrad. As the division's tank column approached Krasnogvardejsk (today Gatchina) on the way from Luga to

Leningrad on the morning of 19th August, 1941, a small force from the Soviet 1st Tank Division waited in ambush. Under the command of tank commander Lieutenant Zinovi Kolobanov, five well-hidden KV-1 tanks had positioned themselves in woodland at the edge of a marsh near to the road to Krasnogvardejsk.

AS THE VEHICLES of the 8th Panzer Division approached, Kolobanov ordered his men not to fire until the Germans were at close range. The lieutenant fired the first shot personally, which hit and crippled the leading German vehicle. The Germans mistakenly assumed that it had run over a tank mine and the whole column stopped. This gave Kolobanov the opportunity to destroy the next lead vehicle and then the last in the column.

The drivers of the remaining German tanks tried to flee from the road in panic but became bogged down in the marshland. There, the armoured cars, half-track tanks and other vehicles were picked off one by one by the KV-1 tanks. Another German

Heroes who won victories in KVs

★ Several Soviet tank commanders had great success with the KV.

Zinovi Kolobanov and Dmitry Sholokhov are probably the best known. Another well-known

KV hero was Pavel Khoroshilo. He destroyed 27 enemy tanks, 13 armoured cars and ten guns in his KV tank – which was known as 'Besposhadniy' (the merciless) – before falling in battle on 1st March, 1943. The Soviets lost many of their

best KV crews in 1943 when the Germans finally developed improved countermeasures and were able to fight back. Sergei Klimichev was one of those who fought in the giant KV-2. He defeated ten German tanks in June 1941.

Zinovi Kolobanov
(1910–94)

STALIN'S STEEL MONSTERS



More KV-2 tanks were lost due to mechanical problems than as a result of enemy fire.



From 1941, the KV-1 had extra armour outside both turret and chassis, providing good protection to 110-120-mm thickness.

Panzer Division rushed to the site, but with only Panzer 38(t) and Panzer IV tanks they stood no chance against the KV-1s.

Kolobanov called a halt to the action after firing the last of his 98 shells. Afterwards, he counted the marks of 135 hits to his own tank, designated number 864, but none of them had penetrated the armour. After this one encounter, the entire German advance towards Leningrad halted.

For this victory, Kolobanov received the Order of the Red Banner. He had previously been awarded the same honour for bravery in battle during the Winter War but had been stripped of the award because he “fraternised with the enemy” on the day of the ceasefire.

Kolobanov was decorated for personally destroying 22 German tanks in the fighting on 19th August, 1941, while another 20 were reportedly destroyed by the other tank crews in his unit. Although the Soviets in their excitement had counted every armoured vehicle as a tank, as historian Robert Forczyk points out, the German 8th Panzer Division had undoubtedly been served another crushing blow.

KOLOBANOV BECAME FAMOUS throughout the Red Army, and by following his example, the Russians learned to use the KV tanks to defeat their enemies in battle. This benefited them the following year, in 1942, when the Germans once again went on the offensive on the Eastern Front.

Operation Barbarossa ended with a bitter German defeat in front of the gates of Moscow. By this point, German armoured forces had been mauled with almost 3,000 out of 4,000 tanks lost, largely as a result of KV and T-34 tanks.

“AFTERWARDS, HE COUNTED THE MARKS OF 135 HITS TO HIS OWN TANK”

But instead of combining his forces in order to destroy the Germans, Soviet dictator Joseph Stalin spread the Red Army's attacks along the entire front line, thus diluting their power. By the end of spring 1942, the Soviet Union had suffered such great losses that the Germans had time to rebuild their forces in time for Hitler's next major push. In 1942, the German summer offensive began – this time with the aim of capturing Stalingrad and the oil fields in the Caucasus.

JUST LIKE THE summer before, the Germans quickly broke through in most places and speedily advanced on the ground, while their planes controlled the skies. But in an area north-east of Belgorod, a whole German panzer division was held back by just three tanks.

On 30th June, 1942, the German 6th Army launched its offensive, an advance that would lead to Stalingrad and its downfall. The 23rd Panzer Division took the lead. One of its officers, Captain Ernst Rebentisch, described the start of the offensive:

“At 02.15 the first Stukas flew over the attack positions in the dim morning light and dropped their bombs on Nesternoje, Krugloje and Pestschanoje. At the same time, preparatory fires of the artillery and mortars started along the entire front. The ▶

STALIN'S STEEL MONSTERS

► engines of the fighting vehicles warmed up... The tanks... encountered mines outside Nesterovo. At the same time, they received heavy fire from anti-tank guns and tank fire from rear-slope positions and earthen fortifications."



The KV tanks were named after the Minister of Defence Kliment Voroshilov. Picture was taken in 1934.

The Germans had no idea that the resistance they were encountering all came from two KV-1s and one T-34. These three tanks constituted the total force of Dmitry Sholokhov's Soviet tanks. This was all the power the Red Army had to set against the 23rd Panzer Division, after two whole tank corps had left the region to face the German attacks that had begun two days earlier further north.

Sholokhov had grouped his three tanks into a perfect firing position on some heights overlooking the ravine that the Germans were passing through. Hidden behind some shacks, Sergeants Sergey and Kalinin, the tank commanders on the two other tanks, immediately fired at two German tanks. A third was fired at by Sholokhov's KV-1.

Rebentisch reported that "The first few tanks of both the 1st and 2nd [...companies] were engulfed by flames. Lieutenant Ott of the 8th and Lieutenant von Cossel of the 2nd were killed."

Sholokhov continued to fire. Colonel Karl-August Pochat, the commander of the German panzer regiment, was killed in the turret of his tank.

By constantly changing his firing position, Sholokhov managed to give the Germans the impression that they had encountered a significantly greater force than they actually had. Sholokhov shot a German tank, changed position, then fired at the next one, and continued in this manner while turmoil grew on the German side.

Rebentisch continued:

"While the main Kampfgruppe fought its way forward metre by metre, the Kampfgruppe Müller also had a difficult time of it. The enemy also put up a tough defence in front of it by means of anti-tank guns, tanks and mines. The 3rd Battalion took considerable casualties."

BUT IT WAS the 1st Battalion, at the forefront of the advance, that had the hardest time. "Only two hours into the fight, the 1st battalion had expended all of its ammunition, a sign of the harshness of the fighting," Rebentisch wrote. The battalion commander, Lieutenant Colonel Georg-Hennig von Heydebreck, was injured when his tank was destroyed. By noon, the 1st Battalion had lost half of their tanks.

"It was the hardest and bloodiest fight the tank regiment underwent in its entire history. Many comrades were lost in front of the enemy; the Soviet tankers fought bravely and with

"THE KV TANK HAD ITS HEYDAY IN 1941"

determination." Finally, the 23rd Panzer Division's advance halted and the next day, the Germans managed to break through after a huge endeavour by Stuka dive bombers. By then Sholokhov and his three tanks had been withdrawn.

Sholokhov had destroyed no fewer than 24 German tanks in the fight. A few months later he was awarded his nation's highest honour by being nominated as a Hero of the Soviet Union.

These examples of encounters between early German tanks and KV-1s clearly show the overall superiority of the KV tank. The fact that Kolobanov's KV-1 took 135 direct hits speaks for itself.

Nevertheless, we must not overstate the KV's superiority. Marshal Grigory Kulik, the incompetent chief of the Soviet Artillery Directorate, interfered in the production of KV-1 in a manner that had lasting repercussions. There were two tank guns that would work with the KV-1 and T-34 tanks: the L-11 and the F-34, both with a 76-mm calibre. The F-34 was both cheaper to produce and more powerful than the L-11. The F-34 was produced in Gorky (modern-day Nizhny Novgorod) and the L-11 in Leningrad. Kulik, for political reasons, favoured the gun from the Kirov plant in Leningrad and he threatened the producers of the F-34 to such an extent that they did not dare mass-produce their weapon. The consequence was that all KV tanks were equipped with the poorer L-11 gun when the war broke out in 1941.

IT WAS ONLY when Vasiliy Grabin, designer of the F-34, went to the centre of T-34 production at Kharkiv Locomotive Factory without Kulik's knowledge and persuaded the management to start using the F-34 that the Soviet tanks were given better guns.

But even though the KV had great benefits in terms of personal protection for the crews, there were also many complaints from the soldiers who used it in battle. Many grumbled that the tank was too heavy for its gearbox, meaning the vehicle had to stop before changing gear. The gearbox also broke frequently. The huge KV-2 tank was the worst offender as it weighed 52 tonnes.

Moreover, the view from a KV was limited. When the hatches were closed, the driver could only peek out through a periscope that had very limited mobility, and the laminated glass was of such poor quality that after a while it had become so worn that it was almost impossible to look through.

Further reading:
Operation Barbarossa 1941 – Hitler against Stalin (2016) by Christer Bergström.
★ **KV-1 & 2 Heavy tanks 1939–1945** (1995) by Steven J Zaloga, Jim Kinnear and Peter Sarson.

But the biggest problem was that the KV was more expensive and took longer to produce than the T-34. To rationalise production, the Red Army phased out the KV in favour of the T-34. Production of the enormous KV-2 tank ceased in autumn 1941 by which time, 334 units had been produced.

The death knell for the KV tank came at the end of 1942, when the Germans' new heavy Tiger tank was deployed on the Eastern Front. Suddenly, the roles were reversed. A Tiger's 88-mm gun could penetrate a KV-1's frontal armour from 1.5 kilometres away, while the KV's F-34 gun was unable to pierce the front of a Tiger, which had armour cladding 100-mm thick. Worse was to come when the German Panther tanks arrived in the summer of 1943. These had even better armour than the Tigers and could destroy a KV-1 from 2 kilometres away.

In 1943, production of the KV-1 was scaled back to an average of 56 tanks a month, eventually ceasing altogether in August 1943. During the Battle of Kursk, the Voronezh Front had only 51 KV-1 tanks in service.

THE KV TANK had its heyday in 1941, before the Germans managed to produce better assault guns and tanks. By the end of 1942, the Germans had the best tanks in the war, not the Red Army. However, the tide of the war had already turned and the superior German tanks could only delay, not prevent their coming defeat.

In contrast, the KV, in conjunction with the T-34, played a key role in the Soviet Union's ability to survive the huge battles that followed Hitler's invasion in 1941. As such, the KV-1 played an important role in deciding the outcome of WW II. ★

Christer Bergström is a military-historical writer whose WWII books include *Operation Barbarossa 1941 – Hitler against Stalin*.

The KV and its cousins

★ The first time the KV tank was put into combat was in the Winter War in Finland, between 1939 and 1940, when a small number were tested on the Karelian Isthmus. The first of these tanks took part in an attack on 18th December, 1939, and received nine hits



from shells that destroyed the barrel of the gun. Gradually, the KV-1 was upgraded with thicker armour (another 25–35 mm), a moulded turret instead of a welded one and a better gun (from 1941, the long, powerful ZiS-5 was used).

Production of the KV and key variants

Year	KV-1	KV-2	KV-1S	KV-85	SU-152
1940	141	102			
1941	1,121	232			
1942	1,753		780		
1943			452	130	704
Total	3,015	334	1,232	130	704

KV-1S. Built on the KV hull, but with a slimmer turret, thinner armour, commander's cupola and new gearbox. Faster than the KV-1, but expensive to produce and the hood was not strong.

KV-85. A KV-1S with a larger turret and the powerful 85-mm D-5T gun. It was a stop-gap release in anticipation of heavier tanks like the IS-85.

SU-152. A self-propelled heavy howitzer built on the KV-1 hull. It was equipped with a 152-mm gun.

KV-1S tanks carrying infantry in the Caucasus. The modified tank was never a great success on the battlefield.



HITLER'S TANK HUNTERS

When World War II broke out, the German army deployed a particularly specialised unit – the Panzerjäger, a tough anti-tank force. They had one of the most dangerous tasks on the battlefield: to combat the enemy's armoured and heavily armed tanks.



Three types of destroyer



Infantry with mines

Tank hunters on foot hid from the tanks and attacked their blind spot.




Anti-tank guns

From ditches and forest edges, the tank hunters' artillery fired on the enemy.



Tank destroyers

Some guns were mounted on tracked tank chassis to make them mobile.



During the war, the Germans built increasingly large tank destroyers, which had the sole purpose of eliminating enemy tanks.

NAZI GERMANY 1939

When World War II broke out in 1939, Nazi Germany had only had a few years to build up its armed forces. To compensate for this, the Germans had so-called “tank hunters” who would take up the fight against enemy tanks in different ways.



HITLER'S TANK HUNTERS

BY BENJAMIN ALKERSIG CHRISTENSEN

Hans Roth heard the eerie metallic rustling of their tracks long before the Soviet tanks came into view. Together with his small squad of so-called tank hunters, Roth stared intensely into the dark.

At 03.30 on 3rd July, 1941, the rugged terrain of western Ukraine stretched away from Roth's trench.

"There, on the hill directly in front of us, the Russians suddenly appear." Roth later wrote in his war diary.

Roth and his comrades placed the 300-kg PaK 36 anti-tank gun in position while following the Soviet manoeuvres closely: "Aim 70! Damn it, just keep cool! Patience. Let these *schweine* [pigs] come closer. 100 metres... 90 metres, 80, now 70 metres... Leave the trenches!"

A dozen hidden anti-tank guns fired their deadly payloads:

"Almost simultaneously, ten shells from our ten anti-tank cannons strike the approaching steel monsters. Is it

possible, flames and black smoke are rising from four tanks? Five other tanks are standing motionless."

The tanks had stopped, but the crews were still alive. Along with a small group of men, Roth ran towards the tanks that were still standing to finish them off with explosives and grenades. Meanwhile, the rest of the soldiers moved the anti-tank guns to new positions to get a better angle of fire. Suddenly a new wave of Soviet tanks appeared, and behind them another. They fired the shell after shell at the hunters.

With projectiles howling around their ears, Roth and his squad threw themselves into their trenches while heavy fire continued around them.

"My comrade on the left throws his arms in the air – he's been hit.

TANK HUNTER ELITE

Hubert Brinkforth

In May 1940, Hubert Brinkforth destroyed nine British tanks in under 20 minutes with his 37-mm anti-tank gun.



The cannon that was protecting us suddenly breaks apart – a direct hit. A comrade lies motionless on the ground right in front of me – dead; and to my right a soldier is also shouting for the medic."

The shells fell like rain around Roth and the other Germans:

"I throw myself down on the ground and hold on to the earth. The ground is being ripped up right before me. I jump up once again, almost stumbling over two comrades who have been torn apart from the shelling."

Roth returned to the trench – the only one of 20 men to do so.

In the midst of the chaos, his comrades had moved the anti-tank guns. From their new position, they fired on another five Soviet tanks, and when the third wave of attackers emerged, the

Early anti-tank guns were easy to conceal and could be deployed both in open terrain and in close combat.

IMAGESELECT



Red Army was met by a new opponent in the form of self-propelled anti-tank guns – tank destroyers – that eventually halted their advance. The enemy tanks stood, burning, on the battlefield.

The German Panzerjäger battalions became some of the most feared and deadly during the war. The specially trained troops, whose job it was to search out and destroy enemy tanks, were consistently overlooked in favour of the celebrated panzer armies, despite an impressive number of victories. But when the fortunes of war turned and the armoured forces could no longer hold back the onslaught of Soviet tanks, it was the tank hunters who became Germany's bulwarks.

Tanks needed combatting

The Panzerjäger was developed during World War I as a response to the newly developed British and French tanks, which rolled on to the battlefields on the Western Front for the first time in 1916. The Germans created tank hunters to stop the tanks by any means possible. However, despite strenuous effort, they were unable to resist the ever-increasing number of motorised monsters.

During the inter-war period, the victors allocated huge resources to further developing tanks. In Germany, the army's senior commanders were concerned about the future and looked into all possibilities.

"Particular attention must be paid to protection against tank attacks, which are increasingly available in the armed forces of all nations, except Germany," General Oswald Lutz concluded.

Military analysts agreed that the best defence against tanks was other tanks. But since the Treaty of Versailles forbade Germany to have such combat vehicles, the generals instead invested in defensive anti-tank weapons, until the restrictions were relaxed and Germany could build its armed forces.

In 1925, armaments manufacturer Rheinmetall developed an anti-tank gun that could stop a tank. The small mobile weapon went into production four years later. It shot 37-mm shells at a speed of 762 metres per second. The gun was named Panzerabwehrkanone 36, abbreviated to PaK 36.

German guns fought in Spain

The army quickly created small anti-tank units, training them to combat tanks using a variety of weapons including



Thanks to the Treaty of Versailles, tank hunters in the 1920s could only train with mock tanks and guns.

The Great War gave birth to tank hunters

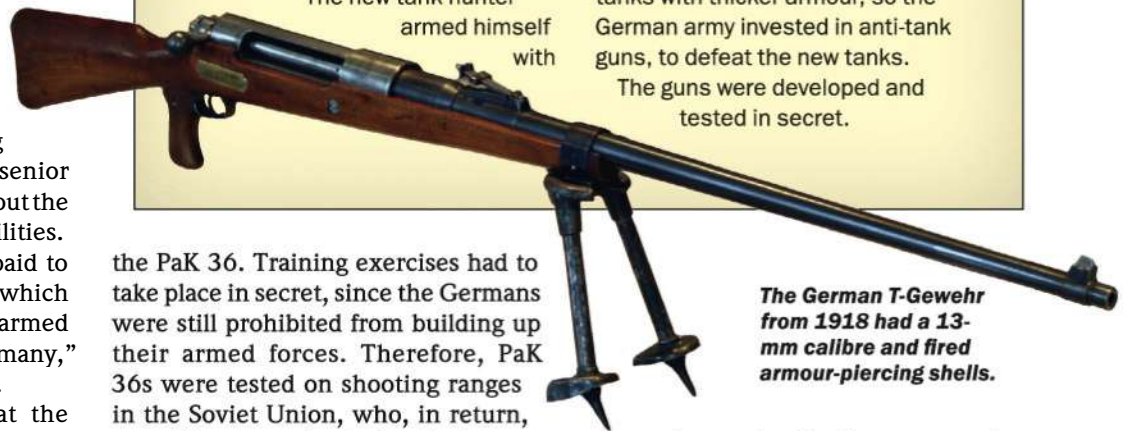
All countermeasures were considered during World War I when the German Army had to find a way to stop the new British and French tanks. In July 1918 the army corps ordered: "When a tank attack is launched, all suitable armament must be used for anti-tank combat and continue firing until the last enemy tank has been destroyed."

The new tank hunter armed himself with

both machine gun and artillery, but one of the most effective weapons was the so-called "T-Gewehr", a 170-kg anti-tank rifle that was delivered to the army in January 1918. The world's first anti-tank gun could penetrate all types of tanks from 500 metres.

In the inter-war period, the victorious armies upgraded their tanks with thicker armour, so the German army invested in anti-tank guns, to defeat the new tanks.

The guns were developed and tested in secret.



The German T-Gewehr from 1918 had a 13-mm calibre and fired armour-piercing shells.

the PaK 36. Training exercises had to take place in secret, since the Germans were still prohibited from building up their armed forces. Therefore, PaK 36s were tested on shooting ranges in the Soviet Union, who, in return, was able to copy the design for its own armed forces.

When the Spanish Civil War broke out in 1936, the new weapons were used in an actual war scenario for the first time. Among the forces Nazi Germany sent to support Franco and his fascists were 17 anti-tank units with ten guns in each. After Franco had won, the OKH (German Army High Command) evaluated the tank hunters' efforts, and in particular the new weapon: "The PaK gun has proved effective; several good results, such as defeating Soviet-built tanks [T-26, BY-5] were noted".

But during the fighting, the guns had also revealed shortcomings: "When these tanks changed their tactic and stopped at some 1,000-metre range, the short-ranged PaK proved

to be useless". Improvements in the sight resolved the problems temporarily, but engineers were then told to build a more powerful gun. Development began, but it would take several years before the replacement would be ready. When Hitler triggered World War II by invading Poland in the autumn of 1939, the tank hunters' main weapon remained the small 37-mm gun.

Tank hunters learned new tricks

During the Poland campaign, tank hunters protected the infantry from tanks. Fortunately for the Germans, the Poles only had a few tanks, and most were lightly armoured, so the obsolete German anti-tank guns had no difficulty taking them out of action. ▶

HITLER'S TANK HUNTERS

Both in Spain and Poland, the tank hunters learned to exploit the PaK 36's low profile. The small guns were difficult to spot from distance, especially when they were hidden in the undergrowth or behind stone walls. The enemy tanks, on the other hand, could be detected from some way off, since their profile loomed high in the terrain. It gave the tank hunters an opportunity to fire at the enemy before their own position was discovered.

Skilled tank hunters could get off one or even two shots before the enemy discovered their position, at which point they quickly moved the lightweight PaK 36, which could be easily manoeuvred by hand. If they were lucky, the enemy failed to notice that the gun had moved and started shooting at the abandoned position before being fired on from the tank hunters' new position.

Guns were mounted on tracks

The campaign in Poland also taught the Germans another important lesson. On several occasions it turned out that enemy tanks moved faster than the German anti-tank guns. The solution was to make the guns self-propelled.

Germany had started to build its first light tanks soon after Hitler came to power in 1933. When the war broke out six years later, these vehicles were obsolete. In the winter of 1939-40, therefore, the army began to rebuild the tanks as so-called "tank destroyers". The turret was removed, and a Czech anti-tank gun installed, which had been captured by the Germans after annexing Czechoslovakia in 1939.

This solution meant the gun couldn't be rotated; it

could only be raised and lowered. Around the gun, a high shield was welded to protect the gunner. Panzerjäger I, as the self-propelled anti-tank gun was called, was inexpensive to build, could be moved quickly around the battlefield and came with a 47-mm gun that was more powerful than the small PaK 36's. The new anti-tank weapon was deployed during the Invasion of France in the summer of 1940, but even though it had a bigger gun, its effective range was only 600 metres. Also, its crew found it difficult to spot the enemy.

"Observation was limited; the crew, with the exception of the driver, had to look over the gun shield to observe what is in front of the Panzerjäger I, resulting in the exposure of body parts to potential dangers; namely shots to the head," one crew pointed out.

Nevertheless, the vehicles were surprisingly effective and took out nearly 100 French tanks.

Russian tanks proved formidable

In Poland and France, the tank hunters had managed to destroy enemy tanks with few problems. But when Hitler invaded the Soviet Union in 1941, the German units abruptly faced tanks of a completely different calibre.

The Soviets' medium-sized T-34 and heavy KV-1 tanks were virtually impossible to penetrate with a Panzerjäger I or a PaK 36 except when using the latest armour-piercing shells, but in the summer of 1941 they made up a mere six percent of all anti-tank ammunition. In addition, the German troops were surprised at how many tanks the Soviets had.

TANK HUNTER ELITE

Diedrich Lilienthal

The 22-year-old tank hunter knocked out seven Russian tanks in February 1943. When the Soviets attacked again, he destroyed 18 more.



GETTY IMAGES

"Never have we experienced anything like this: 100 Russian tanks are fighting against us. The most important thing is to keep the blood cool and the nerves calm," Roth wrote on 23rd June, 1941.

Fortunately for the German tank hunters, nine out of ten Soviet tanks were light tanks, which the German shells could cut through easily. Thousands of light tanks were easy prey for the hunters. However, it was clear to everyone that the campaign in Russia would be extremely brutal compared to that in France.

"The French would have learned from experience and attempted to avoid unnecessary casualties. These guys here fight like mad until nothing moves. They never surrender!" Roth confided to his diary.

When Soviet heavy tank production took off, there was an urgent need for an anti-tank gun that could penetrate the thick armour of the new vehicles. A report from the 88th Infantry Division in the autumn of 1941 stated:

"The 37-mm PaK can no longer be used to combat the new types of Soviet tanks... The panic within our infantry when facing attacking Russian tanks cannot be remedied by education and training; we quickly need sufficient numbers of better weapons".

Several units received an improved gun, a 50-mm PaK 38, but even that had difficulties penetrating Soviet armour. In 1942, the tank hunters were finally given what they had longed for: a 75-mm PaK 40 gun – twice the calibre of the PaK 36. The new gun was towed behind a truck and placed in strategic positions in anticipation of an attack.

Despite its size, the gun had a low profile, and it had a low gun shield that the crew could hide behind in relative safety. For an enemy tank crew, the first – and last – sight of a PaK 40 was typically a flash from its muzzle, immediately before the gun's projectile cut through the tank's hull. The gun was a success, and over 23,000 were built.

New tank destroyers

Early in the campaign against the Soviet Union, the Germans captured guns and fitted them to the undercarriage of tanks captured in France and ►

Tank hunters fought against Soviet T-34 tanks on the Eastern Front.

IMAGESELECT



On the Eastern Front, German tank hunters used, among other things, remote-controlled Goliath tracked mines.

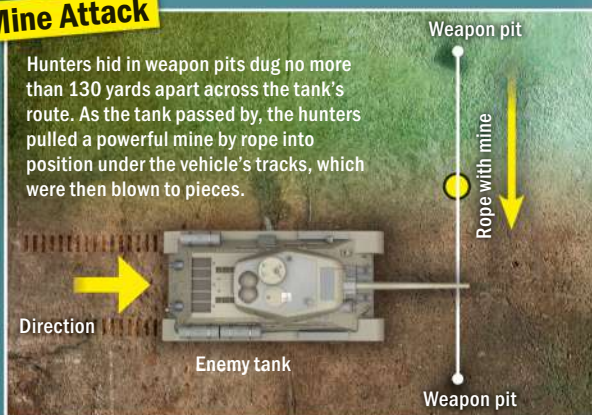
GETTY IMAGES

Hunters on foot could triumph over the armoured monsters

German tank hunters developed tactics to defeat enemy tanks without artillery. The hunters hid and exploited the tanks' blind spot so that they wouldn't be seen until it was too late. According to German training manuals, "They must face the enemy tank calmly [and] 'let it come'. It is always wrong to run away. While moving, the single soldier is inferior to the tank. In hiding... he is usually superior."

Mine Attack

Hunters hid in weapon pits dug no more than 130 yards apart across the tank's route. As the tank passed by, the hunters pulled a powerful mine by rope into position under the vehicle's tracks, which were then blown to pieces.



SHUTTERSTOCK & HISTORIE/MONTAGE

Attack with explosives

1 Obscure the view with fire and thick smoke

The first step in attacking a tank was to light a fire with, for example, straw and fuel. The thick smoke masked the view and often forced the crew to slow down or stop.

3 Take the crew out

When the tank had stopped, the tank hunters attacked the crew. With explosives they destroyed the tank's machine guns before opening the turret. Then they threw hand grenades into the tank.

4 Keep infantry away

During the attack, hunters with machine guns provided cover for their comrades. With concentrated fire, they held off enemy infantry to prevent them from defending the tank from the tank hunters' attack.

2 Take advantage of tank's blind spot

The tank was most vulnerable to its sides and rear. From their hiding places, tank hunters therefore attacked the tank's blind spot – the rear and opposite end to the gun barrel. Using shells or mines they destroyed the tracks so that the tank could not move.

The tank's blind spot

Infantry toolbox



Petrol bombs

Petrol and oil bottles were ignited and thrown at the tank. If they hit the air intake, they could shut off the engine.

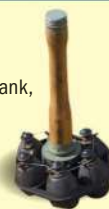


Magnetic mines

The 3.5-kg magnetic mine could be attached to the tank's hull. It could rip armour up to 140-mm thick.

Grenades

A single grenade couldn't damage a tank, but seven grenades in a bundle were enough to destroy its tracks.



Remote controlled bombs

The electric Goliath tracked mine had 60 kg of explosives and was remotely controlled – it was driven to the target using a cable and then detonated.



Teller mine

The mine contained almost six kilograms of explosives. It was designed to destroy the tank's tracks.



SHUTTERSTOCK & HISTORIE/MONTAGE

HITLER'S TANK HUNTERS

Three types of shells drilled through armour

German anti-tank guns were typically fitted with three types of ammunition, each serving its own purpose:

Panzergranate 39 This armour-piercing shell was the most widely available. When it hit its target, a soft steel cap weakened the armour on impact. Behind the tip lay a core of hardened steel that penetrated the hull. Inside this was a time-delayed explosive charge that detonated inside the tank.

Panzergranate 40 This further development of the PzGr 39 had a heavy metal tungsten core, which gave it high penetrative ability. The projectile's weight was concentrated in a smaller area to improve the effect on impact, but also meant the shell did less damage inside the tank.

Panzergranate 38 HL/B This shell had a low muzzle velocity and less weight. But when it hit, an explosion shot from inside the shell outwards with a jet of glowing iron that penetrated the hull and could ignite, for example, the tank's ammunition store.

Shell penetration capacity*

Distance	100 m	500 m	1000 m	1500 m
PzGr. 39	108 mm	96 mm	80 mm	64 mm
PzGr. 40	143 mm	120 mm	97 mm	77 mm
PzGr. 38 HL/B	75 mm	75 mm	75 mm	75 mm

* Towards armour of different thickness set up at a 30 degree slope

Czechoslovakia. The result was the tank destroyer Marder (Marten). With its PaK 40 gun, the vehicle became even more effective which became evident during the fighting in North Africa.

On 15th June, 1942, a unit of Marder tank destroyers surprised a superior British force of at least ten heavy Matilda tanks. Once sighted, the Germans bombarded the British tanks with shells. The first tank was hit 42 times before it shook and came to a standstill. The crew crawled from the vehicle. Then the tank hunters concentrated their fire on the next tank. The shells hit the hull with loud bangs and bounced off and disappeared into the air. Again and again they struck – probing for a way in. The Matilda's gun didn't have the reach to hit the Marder, so it continued its bombardment, unhindered.

The tank was finally shrouded in a dark cloud, and as the wind lifted it black smoke poured from every hatch. The crew failed to appear.

According to the eyewitness, the third tank received five direct hits before the remaining vehicles surrendered. The Germans had won the battle without a loss.

The 75-mm PaK 40 could take out most tanks. Yet, it was not the one that the Allied tank crews most feared; that was a gun

Artillery watched the enemy

The smallest anti-tank guns could not match tanks in one-on-one duels. The only way around this was to attack from hidden positions.

Tank hunters were used defensively. Although the name suggests that the units would hunt for enemy tanks, it was most effective to wait for the enemy to come to them. The units were attached to German divisions and deployed in locations where armoured attacks were expected.

The vast majority of tank hunters used anti-tank guns against the enemy. These were extremely vulnerable if discovered. The tank hunters were, therefore, experts in camouflaging their artillery and exploiting hiding places in the form of ditches, forests or buildings. Here, the guns were placed so that they covered the routes that enemy

tanks advanced through when they moved forward. A Russian report explained how an attack on a prepared armoured position often occurred.

"When the Soviet tanks arrive within 600 and 1,000 yards of the forward edge, individual anti-tank guns (chiefly regimental) are brought into action. The main mass of artillery comes into play when the range has been reduced to between 150 and 300 yards. The German positions are so arranged that they can cope with attacks from two or three directions at once. Their anti-tank gun crews prepare two or three emergency positions."

The smallest

Fox on the battlefield

The small PaK 36 gun weighed just over 300 kg and could be easily dragged around the battlefield by hand. The anti-tank gun, which was of 37 mm calibre, was so small that it was easy to conceal. Its shells could penetrate the hulls of most light tanks.

Effective range: around 600 m
Shells per minute: 13



TANK HUNTER ELITE

ironically not built to destroy tanks.

Anti-aircraft gun tore up everything

The Flak 36 and its successors were designed to shoot down planes at high altitude. The gun had a high muzzle velocity to be able to send anti-aircraft shells nearly ten kilometres into the air. The German Army spied a huge opportunity because shells fired at greater speeds could penetrate thicker armour.

In the Soviet Union in 1941 and 1942, the Germans began to encounter difficulties with the enemy's increasingly improved armoured tanks. Tank hunter Hans Roth was tasked with protecting the infantry. Soviet infantry stormed the Germans, but according to Roth, they weren't difficult to repel:

"The extremely heavy tanks that accompany the attack are much more dangerous. Our defence, including artillery as well as tank fire, is virtually powerless against these rolling monsters. Tank shells in addition to special ammunition are deflected without effect from the heavy armour," he wrote in February 1942.

The solution was to redesign the Flak 36 as an anti-tank gun. The seven-tonne heavy gun was equipped with armour-piercing shells and redesigned

Gerardus Mooyman

Dutch SS volunteer Gerardus Mooyman was 19 when he first destroyed four Soviet T-34 tanks in February 1943, adding another 13 over the following days.

NATIONAL ARCHIVES OF THE NETHERLANDS/SPAARNESTAD PHOTO



to fire horizontally. The result was one of the most powerful guns of World War II. With its 88-mm calibre, the Flak 36 could break through almost all armour. Among the soldiers, the gun was commonly called the "Eight-eight".

American Alexander Hadden experienced how effective the gun was – "It could knock out an American tank, that is pierce the tank's armour and kill the crew inside, with great ease", he said after the war.

But even though the Eight-eight was powerful, it also had its drawbacks. It was heavy to move, and it took a long time to load. The gun was therefore only usable in positions where tank attacks were expected, and it only accounted for four percent of Soviet tank losses during the period 1941-43.

Bunker buster was a tank destroyer

Early anti-tank guns suffered from a serious defect. They were not well-armoured, and couldn't survive a direct hit from a tank. Within German artillery units, the troops already had a fully-armoured vehicle: the *Sturmgeschütz* or *StuG* (assault gun).

This self-propelled artillery gun was built to destroy bunkers and fortified posts and could easily be converted

into a tank destroyer. The StuG's short-barrel gun was replaced with a 75-mm anti-tank gun. The rebuilt StuG became the most widely used tank destroyer of the war.

In September 1941, five StuGs came up against 50 Soviet T-34 tanks. The Germans were quickly surrounded, but took the fight to their attackers, who were supported by infantry. The five StuGs defended themselves, knocking several tanks out of action. But in the process four of the five tank destroyers were lost.

The remaining StuG commanded by Oberstleutnant Heinz Baurmann opened fire with the main gun while its machine gun mowed down the Soviet infantry. The crew of the StuG fought for their lives and eventually overcame the Soviet force, which withdrew, leaving behind 33 burning tanks.

Tank hunters went on offensive

In the long run, even the StuGs couldn't stand up to the Soviet tanks in the increasingly brutal war on the Eastern Front. In 1942, almost 13,000 medium-sized T-34 and 2,600 heavy KV-1 tanks rolled out of Soviet factories.

Roth, who was deep inside Russia during the winter of 1942, had to fight off Soviet tank attacks on a daily basis in temperatures of up to minus 40 degrees Celsius:

"At home, they will never be able to have even a remotely accurate ▶

The most common



PaK 40 went big game hunting

As enemy tanks became better armoured, tank hunters had to upgrade their guns. The PaK 40 anti-tank gun had a 75-mm calibre and could penetrate most tanks. With a weight of 1.4 tonnes, the gun was somewhat heavier than its predecessor. Despite the weight, it could still be easily hidden. The Germans produced 23,000 units.

Effective range: 1,800 m
Shells per minute: 14

'Eight-eight' drilled through everything

The Allies feared the German Flak 36, which was 88-mm calibre gun. The gun was designed to shoot down planes, but it proved well-suited to take out tanks as well. The seven-tonne gun could smash through 105-mm-thick armour at a

distance of one kilometre. The heavy gun was, however, difficult to both move and difficult to hide.

Effective range: 14,800 m
Shells per minute: 15-20



The anti-tank Flak 36 was so large that it required a crew of ten to operate.

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The Flak 36 could even take out the heavy Soviet KV-1 tank.

The most feared

HITLER'S TANK HUNTERS

The tank crusher was a rolling nightmare

Among Nazi Germany's many tank destroyers, the so-called "Jagdpanther" was in a class of its own. The self-propelled tank crusher was well-armed, mobile and had one of the war's most powerful anti-tank guns.

In 1944, the tank hunters' best weapon against enemy tanks was obvious. The Jagdpanther was armed with one of Nazi Germany's most powerful anti-tank guns, the PaK 43. Its artillery consisted of an 88-mm gun – the same as the dreaded Flak 36. But the shells for the PaK 43 gun were heavier and fired at an even greater speed. PaK 43 could

therefore break through 150-mm thick armour at a distance of 1.5 km – enough to knock out any tank on the battlefield.

The powerful gun was mounted on a Panzer V Panther chassis – a German technical marvel. The tank destroyer, which was heavily armoured, weighed a little over 45 tonnes. Like all other anti-tank weapons, it lacked the rotatable

gun turret, but its designers gave it an impressively low profile, which kept it low to the ground and made it possible to hide from the enemy. The Jagdpanther was so effective on the battlefield that the Germans nicknamed it *Panzerknuscher* (Tank crusher). However, the vehicle arrived too late to make any decisive difference to the war.

The best armour

PERISCOPE: the crew could safely get an overview of the battlefield in front of them through a periscope.

RADIO: each Jagdpanther was equipped with a radio that allowed the crew to communicate with each other over the deafening noise of the engines.

MACHINE GUN: to defend the Jagdpanther against enemy infantry, it was equipped with a MG34 machine gun.

CREW: originally, the Jagdpanther was designed for a crew of six, but this was cut to five to save space for an additional ten shells.

OSPREY PUBLISHING

AMMUNITION HATCH: the Jagdpanther had an easily accessible hatch to quickly dispose of used shell cases.

GUN: a well-prepared crew could fire between six and ten shots per minute with the huge gun.

Jagdpanther in brief

Weight:	45.5 tonnes
Length:	9.7 m
Width:	3.4 m
Height:	2.7 m
Gun calibre:	88 mm
Machine gun:	MG34 7.92 mm
Number built:	419

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Rolling hunters in their thousands



Biggest hunter

Sturmgeschütz was the largest of the German anti-tank weapons, although it was originally designed to smash bunkers. It wasn't until 1944 that the German Army estimated that the tank destroyer, which was produced in huge numbers, had put out 20,000 enemy tanks and other vehicles. **Quantity produced (StuG III only): 10,086**

Biggest failure

Ferdinand, which weighed 65 tonnes, soon showed obvious weaknesses. It had no machine gun to defend itself against enemy infantry, and was almost impossible to tow from the battlefield if it needed repairs, requiring five Bergepanzer IV armoured recovery vehicles to pull it. Many Ferdinands, therefore, had to be abandoned because of mechanical failure or as a result of attacks by enemy infantry, who disabled the monster with Molotov cocktails. **Number produced: 91**



Largest gun

Jagdtiger with its 128 mm PaK 44 L/55 was the most powerful gun the Germans produced. The gun could break through 212-mm, 30-degree sloping armour at 500 metres. It could knock out all Allied tanks. **Quantity produced: 70**

TANK HUNTER ELITE

Ludwig Barth

35-year-old Ludwig Barth was honoured with the Knight's Cross after he defeated 33 Soviet tanks in a single week in August 1942 with his anti-tank gun.



DAS RITTERKREUZ UND DER INTERZÜTZER

picture of the demands that this defensive fight in the East requires of us: exhaustion, mobilisation of will power, and personal sacrifice! Up front are the infantrymen, then us, the tank hunters, their eternal companions and most faithful friends!"

In the summer of 1942, the German forces Roth worked alongside attempted an offensive in the Caucasus with the objective of taking the Soviet oil fields. But again the Germans encountered fierce resistance. In the battles for the strategically important city of Voronezh by the river Don, the Russians sent wave after wave of tanks against the Germans.

"In the short time from 10th July to 24th August alone, 978 enemy tanks were destroyed." Roth reported.

The presence of a large Soviet force meant that the German tanks failed to keep pace. Therefore, it was decided to give the tank hunters a more offensive role to help the tanks. The tank destroyers were relatively cheap and quick to build, since they had no revolving turret.

This new role, however, required a whole new generation of better armoured tank destroyers. The heavier armour on the new vehicles reduced their mobility, but in return they gained far greater firepower and could survive if they were hit by enemy fire. To reinforce the shift from smaller, self-propelled anti-tank guns to a larger armoured monster that could take up the fight against enemy tanks, the Germans changed the name from *Panzerjäger* (tank hunter) to *Jagdpanzer* (hunting tank).

The struggle to survive

Among the first of these hunting tanks was the so-called "Ferdinand", which weighed 65 tonnes, two and a half times as much as the Soviet T-34. It was equipped with a powerful 88-mm anti-tank gun. The huge tank was partially deployed on the Eastern Front, where it showed its destructive capabilities. ▶

German anti-tank forces grew during the war to the extent they became almost the size of regular tank forces.

GETTY IMAGES



The *Schwere Panzerjäger-Abteilung 654* (654th Heavy Tank-hunter Battalion), with about 50 Ferdinands, fought in the latter half of 1943 in the same zones as Roth's tank hunters.

According to a report by Unteroffizier Horst Theis, the battalion had great success with its Ferdinand tanks:

"A great achievement by our battalion followed on 24th November, 1943, when only three Ferdinand repulsed a Russian armour attack of about 70 T-34s. We destroyed 47 enemy tanks without suffering any casualties."

In just four months, between 5th July and 5th November, 1943, the battalion destroyed 582 Soviet tanks and 344 anti-tank guns. But the fighting also revealed that the heavy vehicle had its weaknesses. When a Ferdinand tank had to retreat during a Soviet attack, it ended up in a ditch, and because of its heavy weight the vehicle became hopelessly stuck in the mud.

"We tried every trick, throwing blankets and coats, whatever we had, under the tracks. Everything slid through. I prepared the gun for demolition and we ran for our lives," tank hunter Karl Neunert reported.

It also turned out that the engines struggled to bear its heavy weight and constantly broke down. There were also other issues for the hunting tanks, which often had to be left on the battlefield after mechanical failure.

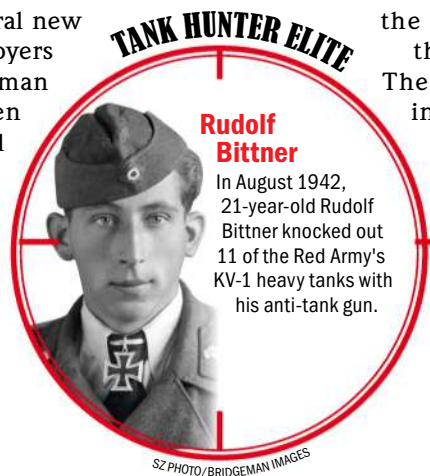
The Soviets, who had pushed the Germans back dramatically in the autumn of 1943, had an advantage here, as they could easily repair their damaged machines.

"If, for example, 45 enemy tanks remain in no-man's land overnight, then 20 of them are missing the next morning. The Russians will have recovered them with half-tracks during the night," a German officer complained. "And we wonder where all the Russian tanks come from!"

Tank hunters held position

During 1943, several new types of tank destroyers rolled out of German factories, but even though some proved effective, it was too late. Nothing could slow down the Red Army now.

"There are too many tanks and much too much



Armoured wave from the east couldn't be stopped

German anti-tank hunters knocked out thousands of Red Army tanks, more than 1,000 new tanks rolled out of Soviet factories every month.

When the Nazis invaded the Soviet Union in 1941, they were hoping to swiftly wipe out all Soviet tanks. Then the German troops would occupy the most important tank factories in the country, so that the Red Army couldn't replace them.

But Hitler had underestimated Stalin, who ramped up tank production at record speed and set up new plants in the Ural Mountains thousands of miles from the front.

Tens of thousands of tanks now rolled from these factories. By 1942 the country had produced 15,000 medium and heavy tanks.

While the Germans built many different models of expensive and advanced tanks, the Russians stuck to 2-3 types of the most technically reliable. Among them was the now-famous medium T-34 tank, of which nearly 60,000 copies were built during the war.



infantry: seven infantry divisions and four tank brigades just in the first days of the attack! The enemy succeeds in breaking through, deploying infantry and later on new tank brigades. In the first five days, 121 tanks are destroyed, only to have 80 new ones deployed the very next day!" Roth wrote from near the city of Kursk in February 1943.

No matter how many tanks the German tank hunters destroyed,

the Soviets replaced them in no time. The Germans had an increasingly difficult time replacing their losses. The reason was, among other things, that they had invested in producing too many different models that all required

individual spare parts. so, a Jagdpanzer was virtually impossible to repair.

The task of the tank hunters had been primarily to defend the infantry against enemy tanks, and now their task was to protect the retreat when in the autumn of 1943 the Soviets began pushing the German forces west. As the constant rearguard, they became a bulwark for Germany, until the Soviets captured Berlin in May 1945.

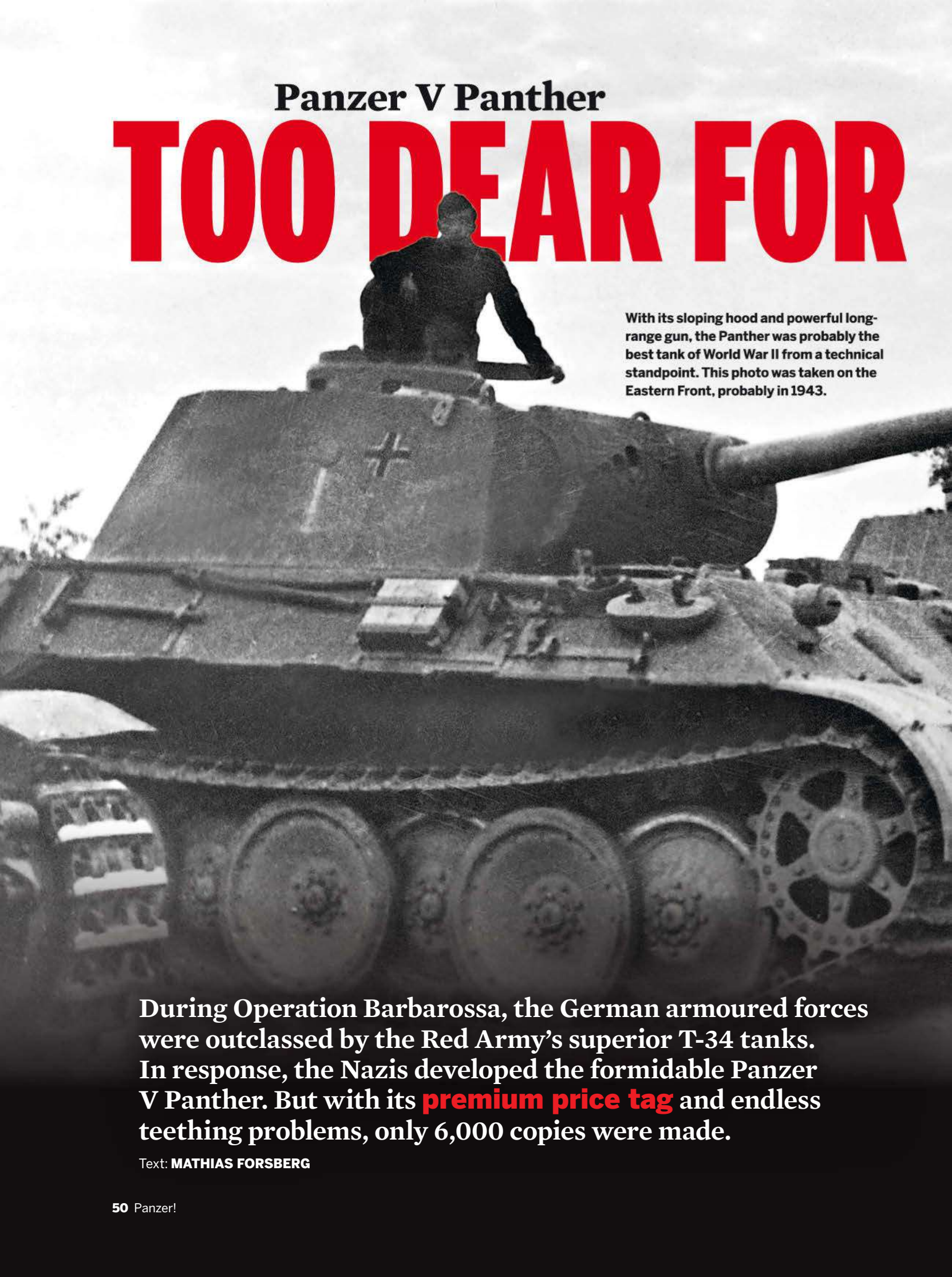
Tank hunter Hans Roth never witnessed the defeat. He was perhaps poring over his war diary when Stalin launched his offensive against German forces in Belarus on 22nd June, 1944 with the participation of 2,700 tanks. Roth was reported missing three days later. His body was never found. ★

READ MORE ABOUT GERMAN TANK HUNTERS



● T Anderson: *The History of the Panzerjäger*, Osprey Publishing, (2018) ● C Alexander & M Kunze: *Eastern Inferno*, Casemate Publishing, (2010).

Panzer V Panther TOO DEAR FOR



With its sloping hood and powerful long-range gun, the Panther was probably the best tank of World War II from a technical standpoint. This photo was taken on the Eastern Front, probably in 1943.

During Operation Barbarossa, the German armoured forces were outclassed by the Red Army's superior T-34 tanks. In response, the Nazis developed the formidable Panzer V Panther. But with its **premium price tag** and endless teething problems, only 6,000 copies were made.

Text: MATHIAS FORSBERG

GERMANY

SCHERL/SZ PHOTO/IBL

**"THE PANTHER
PROBABLY WAS THE
BEST TANK OF THE WAR"**

In any debate about the best tank of World War II, the German Panzer V Panther is usually cited as one of the favourites. With its modern construction, high mobility, strong firepower, crisp optics and sturdy front hood, the Panther was a formidable foe with an awe-inspiring effect topped only by the Panzer VI Tiger. It operated in an environment where it had no rivals. But despite its obvious technical superiority, only 6,000 copies were produced. This was because the Panther had three obvious drawbacks: it was too expensive to produce; it suffered from too many



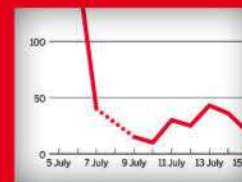
**Rewarded
for ambush**

★ Ernst Barkmann, p55



**Superior
hunter**

★ Jagdpanther, p56



**Combat-
ready**

★ Statistics, p57

PANZER V PANTHER



- mechanical defects; and it only appeared relatively late in the war. The question therefore becomes whether the Panther really was the best tank of World War II?

Production started on the Panther in 1943. An accelerated design process meant that it took about a year to go from the drawing board to the production line. Hasty progress was needed as the Germans were desperate for a tank that could compete with the Soviet T-34. It is a supreme irony that the German army had its greatest successes of World War II – both in the West and in the East – with inferior tanks, while its greatest defeats came with wholly superior machines.

DURING OPERATION Barbarossa in the summer of 1941, the Germans were surprised when they came up against the Soviet T-34 and KV-1 tanks, which outclassed German models in three key areas: armour, firepower and mobility. Several times, groups of T-34s had succeeded in breaking through Hitler's frontline without the Germans being able to put up any kind of resistance. The only thing that prevented the Soviets exploiting such opportunities was the facts that most Red Army tanks lacked radio and effective large-scale coordination tactics.

The German command nevertheless realised the seriousness of the increasingly ominous local

Colonel Karl Lorenz, head of the Großdeutschland Division, in front of a Panther A in Southern Ukraine, January 1944.



Minister of Armaments and War Production Albert Speer ordered Daimler-Benz to produce the Panther.

reports and decided that something had to be done. By autumn 1941, the general staff began to realise that the Red Army would not surrender before Christmas – despite German forces having taken millions of Soviet as prisoners of war. As a result, the Germans needed a plan to upgrade their war materiel sooner rather than later.

IN NOVEMBER 1941, a German tank commission visited Heinz Guderian's 2nd Panzer Group, which was a part of Army Group Centre in order to study captured T-34 tanks and assess the situation at the front. The conclusions were clear: Germany's armoured forces needed a medium-heavy tank that could compete with the T-34 in terms of armour, firepower and mobility.

The army's requirements for a new 30-35-tonne tank were sent to four armament manufacturers. Porsche proposed a smaller version of the Tiger and Henschel a variant of the Panzer IV. Both were refused. Daimler-Benz's prototype was very similar to a T-34, while MAN developed a model with sloping armour that was larger and heavier than the original specification.

MAN's and Daimler Benz's prototypes were tested in the spring of 1942. Minister of Armaments and War Production Albert Speer, along with his predecessor, Fritz Todt, recommended the Daimler-Benz prototype to Hitler. Their prototype was as

heavy and mobile as the T-34, but it had better guns and optics and the engine was a diesel engine manufactured by Daimler.

At almost 45 tonnes, MAN's version was bigger and heavier, but was an entirely new design. The turret had more space, while the suspension and propulsion were more modern, which added a newer feel. MAN's version also had the same engine as the Tiger, which would provide significant coordination benefits. It would also make the Panther – which carried 20 tonnes less weight than the Tiger – both powerful and agile.

In the spring of 1942, after three months of testing, it was decided to award the contract to MAN. Production began shortly after. Initially, the Panther was built just by MAN, but manufacturing soon expanded to include Daimler-Benz and Henschel as well. The turret was manufactured by Rheinmetall.

One of the most significant factors in the Panther's pre-production phase was the way in which the German engineers were allowed to deviate from the army's initial specification – which had been based on actual requirements – to create a much more powerful machine. Of course, the problem with increasing the weaponry and the weight of the armour was that the tank became more expensive to manufacture and more complicated to maintain. It also made greater demands on the surrounding infrastructure, such as bridges and rail transport.

THE PANTHER HAD its fiery baptism at the Battle of Kursk on 5th July, 1943. The German army had ordered 250 Panthers for May 1943. Despite delays due to training and production, at the start of July, 200 Panthers had entered the German battle lines. The new tanks were organised in two armoured battalions each with 96 tanks and eight command tanks belonging to 39th Panzer Regiment, which was a part of 10th Panzer Brigade in Panzergrenadier-Division Großdeutschland.

Preparations had suffered due to the forced timeframe and the consequent problems were immediately apparent. During the advance, flames emanated from the exhaust pipes of several Panthers and a number of tanks suffered from faulty fuel pumps, which caused fuel to leak onto the floor of the tank or over its engines. There were more fires and two tanks were consumed by flames before a single shot had been fired.

When they were working their effectiveness was undeniable as 10th Panzer Brigade's commander, Colonel Karl Decker, described:

On 5th July, I started a major attack with the Panzer Brigade but got no farther

“THEIR PROTOTYPE WAS AS HEAVY AND MOBILE AS THE T-34, BUT IT HAD BETTER GUNS AND OPTICS”

than a ravine. In ignorance of our outstanding main gun, eight ‘General Lee’ tanks approached within 2,200 metres. With a few shots they were set on fire and burned like Christmas tree sparklers.

Following the attack, Decker was called to see senior commanders because of personal disputes with the Panzergrenadier-Division Großdeutschland commander, Count ‘Panzerlöwe’ (Tank Lion) Strachwitz. Decker had accused Strachwitz of being “unpleasant” to work with and of deploying the Panthers in a way that increased their losses.

When I returned four days later [10th July], the number of combat-ready Panthers was down to 12, compared to the 200 we had had at the start of the offensive, just because of idiotic tactical dispositions.

Decker's commentary illustrated the Panther's troubles at Kursk. As statistics show, the number of combat-ready Panther tanks sank rapidly: during most of the Battle of Kursk, there were five-to-six Panthers in the workshop for every tank in action.

ON THE AFTERNOON of 10th July, Guderian – who since the spring of 1943 had been Inspector General of Armoured Troops – visited XXXXVIII Panzer Corps at the front to assess the Panther's performance. Guderian's conclusion was very similar to Decker's. The tank's technical deficiencies and teething problems could not be overlooked, but it was obvious that the Panther's chances had been adversely affected by the human errors and therefore it would be wrong to judge the new tank too harshly. ▶



T-34 role model with its sloping armour...



... and the German engineers' tank, the Panzer V Panther.



The T-34 surprised the Germans in June 1941.

A new tank!

"The enemy has introduced a new tank! The form is reminiscent of the T-34. The tank has thick armour. The weight is probably 40 to 50 tonnes. Ordnance is probably an 88 mm gun. We have lost tanks in battle from a range of 2,000 metres."

Soviet radio message from the front at Kursk, 8th July, 1943.

PANZER V PANTHER

- Technically, the Panther had fulfilled its designers' high expectations on the battlefield. The long 75-mm gun was a tremendous improvement over previous tank armaments, offering a high degree of accuracy and penetration over long distances. Decker's eyewitness account was not a one-off event: the tanks repeatedly took out Soviet tanks at 1,500–2,000 metres distance, long before the enemy's tanks could threaten the Germans. In Guderian's analysis there were two weaknesses that stood out: the way the tank had to be deployed and its weak flanks.

THE PANTHERS' CREWS consisted of personnel redeployed from other frontline armoured divisions. These divisions had made no secret of the fact that they had sent their least experienced and skilled crews. When the new Panther battalions received their personnel, there was little time to complete the training and the tanks' technical problems made educating the crews trickier still. Some mechanical problems resulted in the drivers pushing the engines too hard.

On the evening of 10th July, there were only ten Panther tanks ready for battle across the two panzer armies. Around 40 tanks had been repaired

US soldiers surround a burning Panther in Normandy, France in 1944. The tank struggled to come into its own in the region because battles tended to be short-range affairs.

“THEY WERE ALSO FORCED TO EXPOSE THEIR VULNERABLE SIDE ARMOUR, WHICH LED TO EVEN GREATER LOSSES”

during the day and were returning to their units. 23 had been destroyed by enemy fire and two had caught fire and been wrecked before the battle commenced. Of the 100 tanks awaiting repair, 56 had been damaged by mines or Soviet shells, while the remaining 44 were suffering mechanical problems. Other tanks had broken down on the battlefield and were waiting to be salvaged and repaired by the workshop forces.

THE MOST OBVIOUS shortcoming of the Panthers at Kursk was the fact that the crews had never trained at anything beyond troop level and lacked the ability to attack in larger formations. This meant that the tank companies did not understand their orders and the tanks bunched together too tightly, resulting in increased losses due to mines. The limited manoeuvring space also prevented the Panther from fully exploiting its benefits.

Another serious problem was the lack of coordination with the mine-clearing engineers. The Panthers suffered unnecessarily high losses because the mines had not been properly cleared before they advanced. They were also forced to



expose their vulnerable side armour, which led to even greater losses, and meant that the Panther's superior firepower and frontal armour was not exploited in the best possible way. To attack successfully, the Panther battalions needed strong protection on their flanks and to spread out more widely than traditional tank doctrine stipulated.

When the Panthers reached the front, it became clear that they were formidable weapons. The Germans stated in short that "the Panther is clearly superior in tank-on-tank battles".

More than 140 enemy tanks were reportedly destroyed by Panther tanks during Operation Citadel's first five days – an inordinate figure, considering the small numbers available for combat. The average distance for destroying a Soviet tank was 1,500 metres, while the longest successful shots were taken from almost 3,000 metres away.

AFTER 11TH JULY, the number of available Panthers rose to about 40 per day and the situation was gradually improving with the queue for the workshops becoming ever shorter. On 20th July about 90 tanks were out of service and in need of repair, 20 had been sent back to Germany for more extensive overhauls, 58 had been written off and 41 were ready for battle. Most of the 58 write-offs had been unrecoverable and had therefore been destroyed by their own crews to avoid them falling into enemy hands.

Its baptism of fire showed that the Panther, like the Tiger, was unsurpassed on the Eastern Front and had no comparable enemies on the battlefield. In the third year of the war, the German mechanised forces had received a medium-heavy tank for the panzer divisions that was far better than its Soviet ►

FRED RAMAGE/KEystone/GETTY



Panther officer Ernst Barkmann excelled in Normandy. This is a Panther in the Falaise Pocket in 1944.

IMPERIAL WAR MUSEUM

Barkmann's ambush earned him the Knight's Cross

★ Ernst Barkmann was a prominent German tank officer and became perhaps the most well-known Panther commander of the war.

Barkmann participated in campaigns during 1939–40 and in autumn 1942, where he commanded a Panzer IV in the 2nd SS Panzer Division 'Das Reich' during the second Battle of Kharkov and at the Battle of Kursk. In August, Das Reich took over the remaining Panther D tanks, and Barkmann was assigned to one of the division's new machines. In January 1944, Das Reich was transferred to France and upgraded to new Panther A tanks. In Normandy, Das Reich fought against US forces around Saint-Lô, where Barkmann carried out the action that made him famous.

On 27th July, during Operation Cobra, Barkmann's 4th Company formed a group to stop a US breakthrough. Barkmann posted himself at a turn in the road where he successfully ambushed large numbers of US tanks and vehicles, halting the offensive.

Barkmann's success in Normandy was probably exaggerated by the Germans.

At least, that was the version of events that led to Barkmann being awarded the Knight's Cross amid a buzz and avalanche of publicity.

However, it has since been shown that US losses were limited to a couple of vehicles from a reconnaissance unit, and that the offensive was never significantly affected. The incident is not even mentioned in US war diaries.

Barkmann excelled during the Ardennes offensive and in later fighting in Hungary in the spring of 1945, where he really showed what a potent weapon the Panther tank could be in the right hands. Barkmann survived the war and died in 2009 at the age of 89.



PANZER V PANTHER

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The Jagdpanther had powerful weaponry and a low profile.

Jagdpanther – the war's best tank destroyer

★ A tank destroyer known as the Jagdpanther was developed alongside the Panther tank. It was used in all the heavy panzer battalions and was equipped with an 88-mm L/71 gun that was capable of penetrating the frontal armour of all tanks of the period. With low profile, heavy armour, compact sloping hood and good terrain features, the Jagdpanther became the best tank destroyer of the war.

Production was initiated in the spring of 1943 with the goal of producing 150 tank destroyers per month. The realities of the war, however, meant that only 392 Jagdpanthers ever reached the panzer divisions, which was too small a number to affect the course of the war.

The Jagdpanther provided inspiration for Swede Sven Berge when he designed the Swedish Striderwagen 103, a post-war era main battle tank.


► rivals. Unfortunately for the Germans, it arrived too late and amid growing setbacks for Hitler's overall offensive: Hamburg had been destroyed in air strikes, the Afrika Korps had surrendered in Tunisia, the Allies had landed on Sicily and the Red Army was attacking with devastating power against the southern sections of the Eastern Front.

After Operation Citadel, production of the Panther switched from the initial model D series to the subsequent version, the Panther A. No-one knows why version D came before version A, but the latter was the model deployed to forces from autumn 1943.

By 1944, the number of tanks in a panzer division was reduced to about 160 (from having been over 300 in 1940) and was divided into two battalions of 80; one battalion kept the Panzer IV, while the other battalion's Panzer IIIs were withdrawn to be replaced by Panzer V Panthers. The frontline panzer divisions therefore concentrated all their remaining tanks into a single battalion and sent the personnel of the second battalion to Germany to be trained on the Panther. Most of the panzer divisions therefore lost important power at a crucial point in the war on the Eastern Front: the winter of 1943–44.

SPEER HAD COUNTED on the production of 300 Panthers per month in 1943, but initial production was considerably slower. Strangely, by the autumn of 1944, despite setbacks on the field and intensified Allied bombings, production increased and 380 vehicles were manufactured in March 1945.

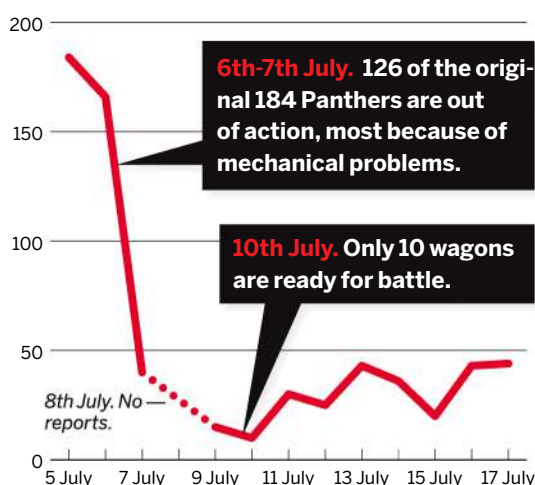
By the summer of 1944, 31 panzer battalions were equipped with Panther tanks and most of the panzer



German infantry from the Großdeutschland Division moves forward on the Eastern Front flanked by a Panther tank.

Combat-ready Panthers

Kursk, 5th-17th July 1943 (approx. 18.00).



divisions now had a battalion of Panzer IVs and one of Panthers. However, the majority of panzer battalions never made it back to their own 'home' divisions – the war situation meant that they were often attached to other panzer divisions instead.

The troops on the Western Front had their first large-scale encounter with the Panther in Normandy. Seven of the German panzer divisions in France included a Panther battalion and almost 600 Panther tanks were inserted into the region. All were Panther A tanks.

Unfortunately, the new model came with its own share of mechanical problems, which periodically

became critical owing to a severe shortage of spare parts. The engine still caught fire sometimes, too. In battle, however, the Panther was as formidable as on the Eastern Front – but after a month 112 Panthers had been destroyed.

Sergeant Francis Baker, tank commander on a Sherman M4A3, wrote about his encounter with a group of Panthers:

Ordering my gunner to fire at the closest tank, which was approximately 800 yards away, he placed one right in the side that was completely visible to me. To my amazement and disgust, I watched the shell bounce off the side. My gunner fired at least six more rounds at the vehicle hitting it from the turret to the track. This German tank, knowing that I possibly would be supported by a tank destroyer, started to pull away. I was completely surprised to see it moving after receiving seven hits from my gun.

Baker had the command of an M4A3 (76). This was the most powerful version of a Sherman tank, and it should have been able to penetrate a Panther's side armour at that distance.

THE PANTHER COMPLETELY outclassed the British and US tanks, but it was rarely able to show ▶

“THE PANTHER WAS RARELY ABLE TO SHOW ITS SUPERIORITY IN NORMANDY”

★ FACTS

Panthers could see in the dark

During spring 1945, the Germans experimented with night sights that registered infrared (IR) light enabling them to fight in the dark. Some Panther tanks were equipped with such sights, and they formed small combat groups along with infantry who were also equipped with night-vision aids and StG 44 assault rifles with night sights.



An IR sight mounted on a Panther.



SCHERU/SZ PHOTO/BL

PANZER V PANTHER

► its superiority in Normandy. The difficult terrain meant that the distances in combat were often only a few hundred metres and with such short distances many of the Panther's advantages were neutralised. Psychologically, it was the Tiger that inspired fear among the Allies and reinforced German courage, not the Panther.

Tank driver Müller was part of a four-Panther reconnaissance patrol from the 24th Panzer Regiment when his tank unexpectedly encountered a group of Sherman tanks on a sunny summer's day at the beginning of August 1944. Müller immediately spotted two Sherman tanks 1,200 metres away. The Panther's first shot landed short of the Sherman it was targeting, but its second hit, forcing the crew to scramble out of the damaged tank. The two Sherman's weren't alone, though: Müller's commander had seen more Sherman tanks in the vicinity and he suddenly received orders over his headphones to back away from the fight. (This was a standard manoeuvre for Panthers to avoid presenting their weak side armour as a target for enemy gunners.) At least eight Sherman tanks were confirmed on their flanks. Müller's commander quietly gave orders to turn towards the threat and open fire. The Panther shot at three different Shermans, but their rounds had no effect.

Suddenly there was a bang and Müller's tank was hit. The tank caught fire, but Müller managed to drive it 300 metres before the heat forced him to give up. The driver waited for the radio operator to jump up and escape, then followed. Outside, the tank commander was lying on the ground with both legs blown off at the knees. The commander handed his dog tag and wallet to Müller and asked him to visit his parents, then ordered him to follow the rest of his crew who were already fleeing back to the German lines.

IN AT LEAST one case, an historic battle occurred between a Tiger and a Panther. During the war, the Red Army and the Allies had captured a number of Panther tanks, some of which were put back into

“THE PANTHER WASN'T THE TANK THAT GERMANY NEEDED TO WIN THE WAR”

service on the front. In the late summer of 1944, French resistance fighters captured two intact Panthers, which they quickly put into battle against the retreating Germans. In the area around Rouen, they met a group of Tiger tanks from 2nd SS Panzer Battalion which made short work of the French Panthers. This seems to be the only documented battle between Tiger and Panther tanks.

Most of the Panthers lost in Normandy were abandoned or destroyed by their own crews due to mechanical failures, or because it was impossible to save them. Few were destroyed in battle, and almost none during Allied air raids. The reliable and robust Panzer IV tank was more than adequate for the war in Northern France; the Panther, on the other hand, was an expensive and unreliable choice for Panzer Group West.

About half of the Panthers produced were the last version, G. This version appeared during the armoured forces increasingly desperate struggle in the winter and spring of 1944–45. On the Eastern Front and in Hungary, attacking Soviet armoured forces still suffered occasional heavy losses when they met Panther forces – tanks manned by experienced crews could produce spectacular results. But the number of Panthers produced couldn't fill the gaps in German panzer divisions, and the number of combat-ready Panthers remained at a consistently low level throughout the war.

WAS THE PANTHER World War II's best tank? The simple answer is that the Panther, as a medium-heavy tank replacement for the Panzer III within Germany's armoured forces, was simply too expensive and too unreliable. Equally, it was not

★ FACTS

Surplus of Panther parts

The production of the Panther's various parts was sometimes out of step. Following the bombing of the Maybach factory, engine production lagged behind the manufacture of hulls. Rheinmetall's factory, on the other hand, produced turrets non-stop. The surplus turrets were converted to armoured gun turrets, and installed in fixed positions in defensive works in Italy and on the Western Front.



A Panther II hull at a museum in Fort Knox.

F remained a prototype

★ By 1943, there were already plans for a Panther F – or Panther II – which would share parts with Tiger II, creating a common standard for both. It would carry an 88-mm L/71 gun. The biggest visual difference from the Panther

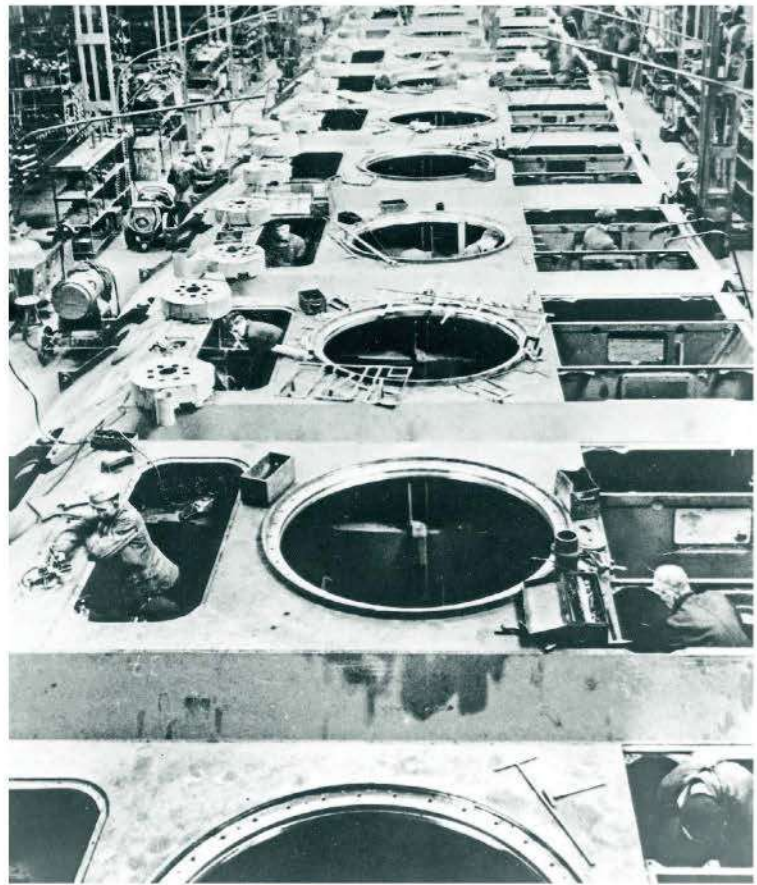
DAF, was in the new model's narrower tower to enhance the turret's ballistic resistance. A prototype hull without a turret was captured by US troops after the war and can be seen at the General George Patton Museum Of Leadership in Fort Knox.



A Panther D tank destroyed during the Battle of Anzio, in central Italy in 1943–44.



A Panther crew marks its tank's gun to show the number of enemy tanks it has taken out of action.



Germany put a lot of resources into producing the Panther. This picture shows one of the Panther factories' assembly lines in 1944.

powerful enough to be a heavy tank. Ultimately, the Germans built a fragile BMW, when what they needed was a robust Toyota.

In spite of its good combat results, the Panther's design meant that the Germans devoted considerable resources to the construction of fewer than 6,000 tanks. By comparison, almost 50,000 Shermans and close to 80,000 T-34s were produced if you include all the various versions. The overall number of Panthers was simply too low to have any impact on the outcome of the war. The tank itself was too expensive in terms of resources.

A lighter and cheaper design, such as the prototype proposed by Daimler-Benz, would have enabled Germany to produce between 6,000 and 9,000 tanks, offering them more useable tanks in 1944. An even better option would have been to focus on developing the Panzer IV. Just after the decision was taken to build the Panther, the Panzer IV was upgraded with a longer gun and improved armour. This enabled it to combat the T-34.

IN TERMS OF TANK destroyer variants, the Jagdpanzer IV was a strong weapon that more than measured up to the JagdPanther. And the

Panther tank production figures

Model	Production period	Units
Panther D	Jan –Sept 1943	842
Panther A	Aug 1943 –June 1944	2,192
Panther G	March 1944 – April 1945	2,953
Total	Jan 1943 – April 1945	5,987

former was much cheaper. By having just a single tank model, it would also have been possible to standardise spare parts, ammunition and transport. The production of the Panzer IV could have been significantly increased if it had been given priority in 1943–45. Another advantage would have been that the German armoured divisions would not have needed to release personnel for training on the Panther during the critical winter of 1943–44.

While excellent in terms of design, ultimately the Panther became a mix between a heavy and a medium-heavy tank, something that simply didn't meet Germany's requirements at the time. The Panther probably was the best tank of the war, but it wasn't the tank Germany needed to win the war. ❗

Mathias Forsberg is a military historian.

Further reading:
Panther vs Sherman: Battle of the Bulge 1944 (2008) by Steven J Zaloga.
★ Panther vs T-34: Ukraine 1943 (2007) by Robert Forczyk.

TANKS IN BATTLE

How combat tactics worked

“OVER THE PERIOD 1943-44 WARRING COUNTRIES HAD DEVELOPED TACTICS AND COMBAT TECHNIQUES THAT WORKED WELL – AND, AS A RULE, ARE STILL BEING USED TODAY.”

During World War II, tank technology and tactics saw **radical development**. Indeed, the same basic principles that were established then still apply to the battlefield today. How did the fighting take place? Harald Sonesson guides us through battalion, platoon and company level.

Gunner Ken Tout found himself on a battlefield south of St Aignan in France on 8th August. The fighting about the Falaise Pocket took place two months after the invasion of Normandy and in his book *Tank! – 40 hours of battle*, Tout gives a snapshot of how it felt in August 1944:

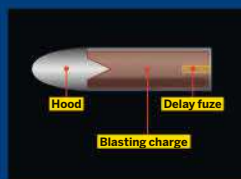
“I work my gun along the known hedgerows and woods. From this new angle I can see more of

the woods across the gully. Trees. Undergrowth. Branches. Intricate, twisting tracery of branches, twigs and leaves. Those twisted variegated shapes felt safe. I count them. Assess them. Trees and branches. Twigs and leaves. A box shape. A box... BOX! Jab gun elevator, twist grip, crosswires ON! STAMP! (Snowie: ‘Hornet! Hornet! Front!’)”

Tout described how a flash spread from the 75-mm gun’s muzzle to blind his telescopic sight, ►

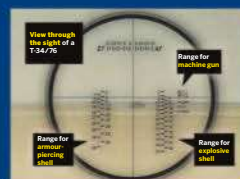
A German Tiger advances during the Battle of Kursk where around 8,000 tanks clashed in July 1943. On the right an abandoned T-34/76 model 43.

SZPHOTO/BL



Armed projectiles

★ Three types, p65



Guns and sights

★ Rain of fire, p68



Who does what?

★ Crew, p70

TANKS IN BATTLE

“LATER IN THE WAR, TANKS HAD ALL-ROUND USE”

- ▶ how the recoil caused the tank to shake and a sulphurous smoke spread through the turret. Then a flash of light from the enemy tank – a hit.

TANKS WERE FIRST put into service during World War I. They became hugely important at the Battle of Cambrai in 1917 when it was discovered they could break through enemy lines. Tactical development varied from nation to nation during the interwar period. The British were the first to produce fast mechanised forces that could operate on their own on the battlefield. The French chose to spread their tanks to support the infantry. The Soviet Union's development was even more advanced, largely due to the extensive secrecy surrounding the armed forces they controlled and what they'd learned from them. Development was slower in Germany because the country had been banned from producing armoured vehicles by the Treaty of Versailles after World War I.

Before the breakout of war in 1939, tanks were usually optimised to address specific operations. There were light and poorly armoured – but fast – tanks for cavalry-like charges over large areas and against the enemy's central forces; also powerful armoured vehicles, often with a howitzer gun to break through strongly defended lines. The fact that these vehicles were heavy and slow was inconsequential as they followed behind infantry, which ultimately determined their speed.

Later in the war, tanks had all-round use, less specialised with a main armament that worked just as well fighting armoured forces as they did infantry and soft targets. The heavier armour often – but not always – offered good frontal protection against armour-piercing ammunition.

With the Soviet T-34/76, the US M4 Sherman and the German Panzer IV F2, mainstream tanks were developed that could, in principle, address all



tasks on the battlefield. The main armament was acceptable, the hood provided adequate protection and the speed was good enough.

EXPERIENCES FROM EARLY in the war meant that over the period 1943-44 warring countries developed tactics and combat techniques that worked well – and as a rule are still being used today. Then as now, tanks were deployed to create decisive breakthroughs and change a battle's outcome. Extensive firepower together with good protection and mobility gave huge




Ken Tout
fought in a
M4 Sherman
during the
invasion of
Normandy
in 1944.

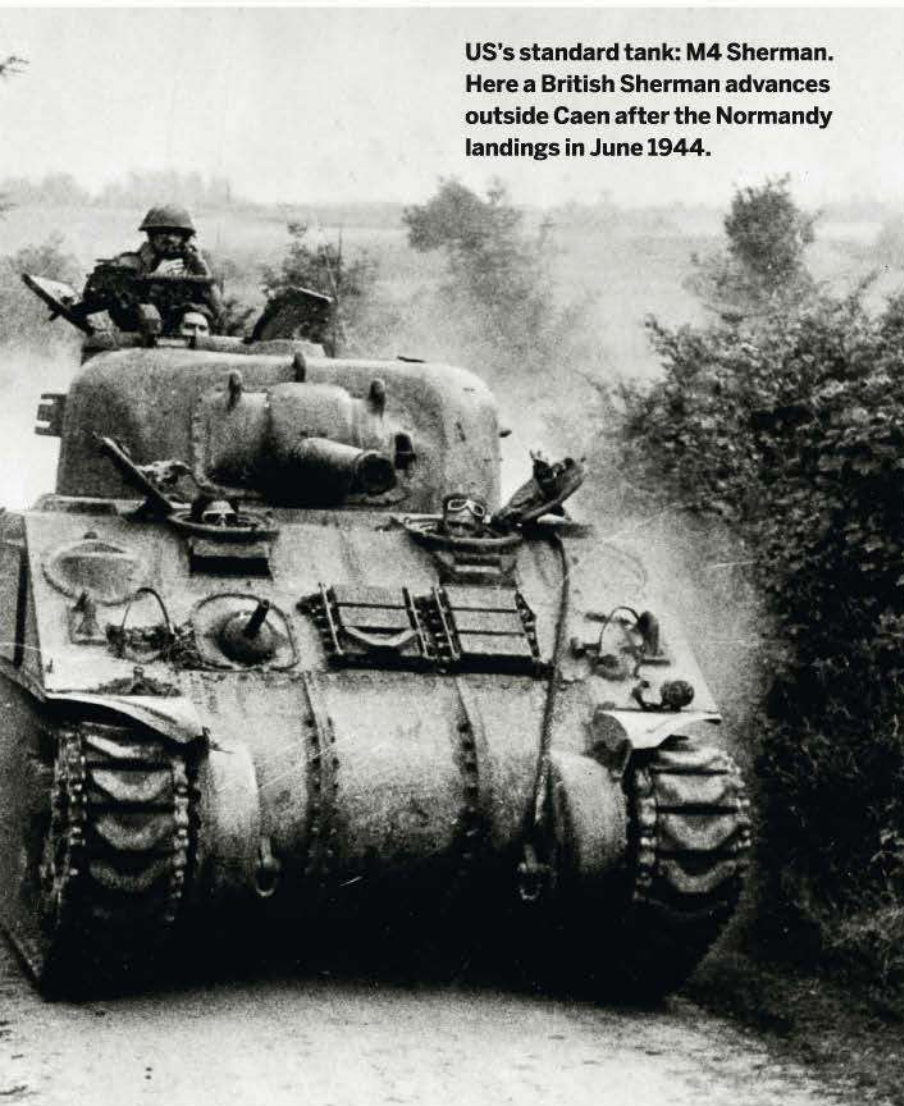
How a tank company was organised in 1943-44



 **USA** 3 platoons x 5 tanks + 2 support tanks



 **Soviet Union** 3 platoons x 3 tanks + 1 support tank



US's standard tank: M4 Sherman. Here a British Sherman advances outside Caen after the Normandy landings in June 1944.

PAUL POPPER/POPPERFOTO/GETTY



Germany's standard tank: Panzer IV F2. In the spring of 1943, additional 'spaced' armour was also introduced outside the turret and body.



power over a limited area that was important to attack and capture.

Often it was about creating a breakthrough in the enemy's front lines and advancing to the enemy's rear where artillery, support and personnel were tempting targets. But first and foremost, the purpose was to capture important terrain – for example, to ensure further advancement or to surround enemy forces. If possible, try to surprise your enemy, which was easier thanks to better mobility. Surprise, mobility and firepower made it easier to achieve

local superiority, which could form the basis for further progress.

ORGANISATION

In the years 1943-44, a tank company consisted mostly of three or four platoons as well as one or two tanks for company staff, typically the commander and his deputy. Each platoon comprised 3-5 tanks. They were organised according to several factors, not least the availability of vehicles. Lack of radio equipment (transmitters/receivers) and access ▶

Soviet Union standard tank: T-34/76. Here's a model from 1942 welded with extra armour and a new driver's hatch with two periscopes.



Great Britain 4 troops x 4 tanks + 3 support tanks



Germany 4 platoons x 5 tanks + 2 support tanks *

* In 1944 three different models were introduced with 10, 14 or 17 tanks in the company.

GRAPHICS:
CHRISTOPHER REHN

TANKS IN BATTLE

► to experienced platoon leaders also played a role. The harder it was to lead, the fewer the tanks allocated to the platoon/company.

🇩🇪 **A MEDIUM-HEAVY** German tank company consisted of 22 tanks – Panzer IV or Panzer V (Panther). These were divided into four platoons with five tanks in each and two as support vehicles.

In November 1944, three different new organisational options equipped with Panzer IVs or Panthers were specified:

- 17 tanks divided into three platoons with five vehicles in each and two support vehicles.
- 14 tanks divided into three platoons with four vehicles in each and two support vehicles.
- 10 tanks divided into three platoons with three vehicles in each and one support vehicle.

In April 1945, 10 tanks were introduced as standard in the Panzer Division Type 45.

🇷🇺 In a Soviet tank brigade or tank regiment, the company consisted of 10 tanks: three platoons with three tanks in each in addition to a support vehicle.

🇺🇸 A medium-sized US company consisted of 17 tanks, which were divided into three platoons with five tanks in each plus two support tanks.

🇬🇧 The heavy British armoured company found in armoured divisions and independent armoured brigades consisted of 19 tanks divided into



Two men from a Soviet tank crew investigate a shell hole in the turret of a German Panzer VI Tiger. Taken July 1943.

four platoon-sized ‘troops’, each with four tanks, as well as three support tanks. When the M4 Sherman Firefly, a M4 re-tooled with a powerful 17-pounder (76-mm) gun, was added in the spring and in the summer of 1944, each platoon was eventually given one, despite the fact the rest of the force was equipped with Cromwell cavalry tanks.

In the armoured division’s tank companies, two of the support tanks had a short 95-mm howitzer instead of a tank gun. The tank company in an infantry company was equipped with 18 Churchill tanks in 1944. Five platoons with three tanks each and three support tanks.



Salvage and repair units were critical for maximising the number of working vehicles. Here in the workshop the soldiers change the engine of a Tiger belonging to the 9th Company in the Großdeutschland Division. Eastern Front 1943 or 1944.

Two of the tanks in the company were equipped with short 95-mm howitzers.

THE NUMBER OF tanks in the units described here are theoretical numbers. In practice, fewer vehicles were available due to breakdowns, damage, destruction in battle or because they were stuck in impassable terrain.

Forces relied on their own resources for salvage and repair, which were critical in maintaining the number of working tanks at their disposal. If there was no time for inspecting or repairing tanks, then the likelihood of breakdowns increased. But the most decisive factor was the army's ability to produce new tanks to replace those that were lost.

THE BATTLE

The tank company usually fought with the rest of the battalion. Some platoons and tanks fought alone, but this was the exception. Tank commanders – and of course platoon and company commanders – had to know at what distance conditions were favourable for entering a battle. If their own armour and armaments were inferior to the enemy, it was critical to open fire at closer range and at a direction that made it possible to penetrate the target – typically the side or rear of a tank rather than its front. If you had better armour and guns, you could fight from a greater distance where you still had the ability to hit while being more or less immune to return fire.

The firing range of tanks varied greatly – partly because of the tank's own guns and ammunition, but also because of the position of enemy tanks along with their size and thickness of armour. In open terrain, the firing range of medium-heavy tanks could be long, and in favourable conditions they could strike and impact armoured targets at distances of well over two kilometres. These perfect conditions were rare – even in open terrain the firing range usually didn't exceed 1,500 metres and was usually significantly less.

The easiest way to prevent damage to a tank was, of course, by avoiding discovery – for example, when advancing by taking advantage of natural cover, the dark or by camouflaging the tank. This way, the ►

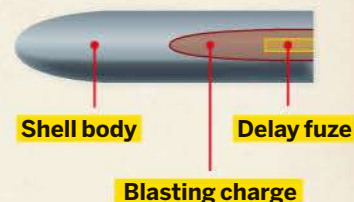
“THE FIRING RANGE OF TANKS VARIED GREATLY”

Three armed projectiles dominated the battlefield

During World War II, three main types of armour-piercing ammunition were used.

Armour-piercing shell

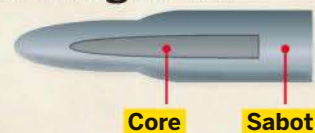
★ The most common shell. The armour-piercing shell was a full bullet (shell diameter equal to the gun barrel) that struck the target's hull before an explosive charge detonated. Its effects were shrapnel generated from



impact, the exploding shell and the pressure effect of the explosion.

Armour-piercing discarding sabot

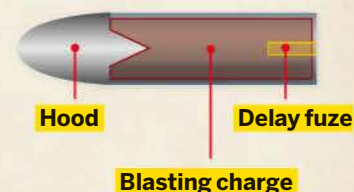
★ APDS is a type of kinetic energy projectile. It was manufactured from tungsten carbide and was significantly smaller in diameter than the gun barrel, which meant the projectile generated a higher exit speed from the barrel than armour-piercing shells. This, coupled with a flatter projectile path and shorter time to impact, meant the projectile offered greater penetration at normal combat



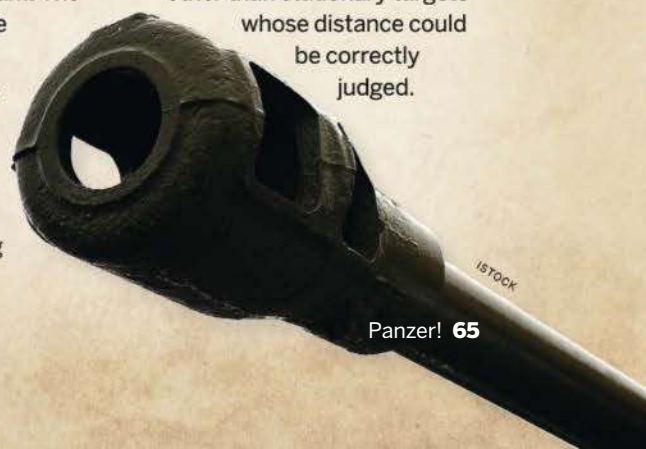
distances. Tungsten was a rare metal, however, and so this ammunition type was never found in enough quantities. From 1943, it was increasingly uncommon among German forces, although supplies increased on the Allies' side.

High explosive anti-tank

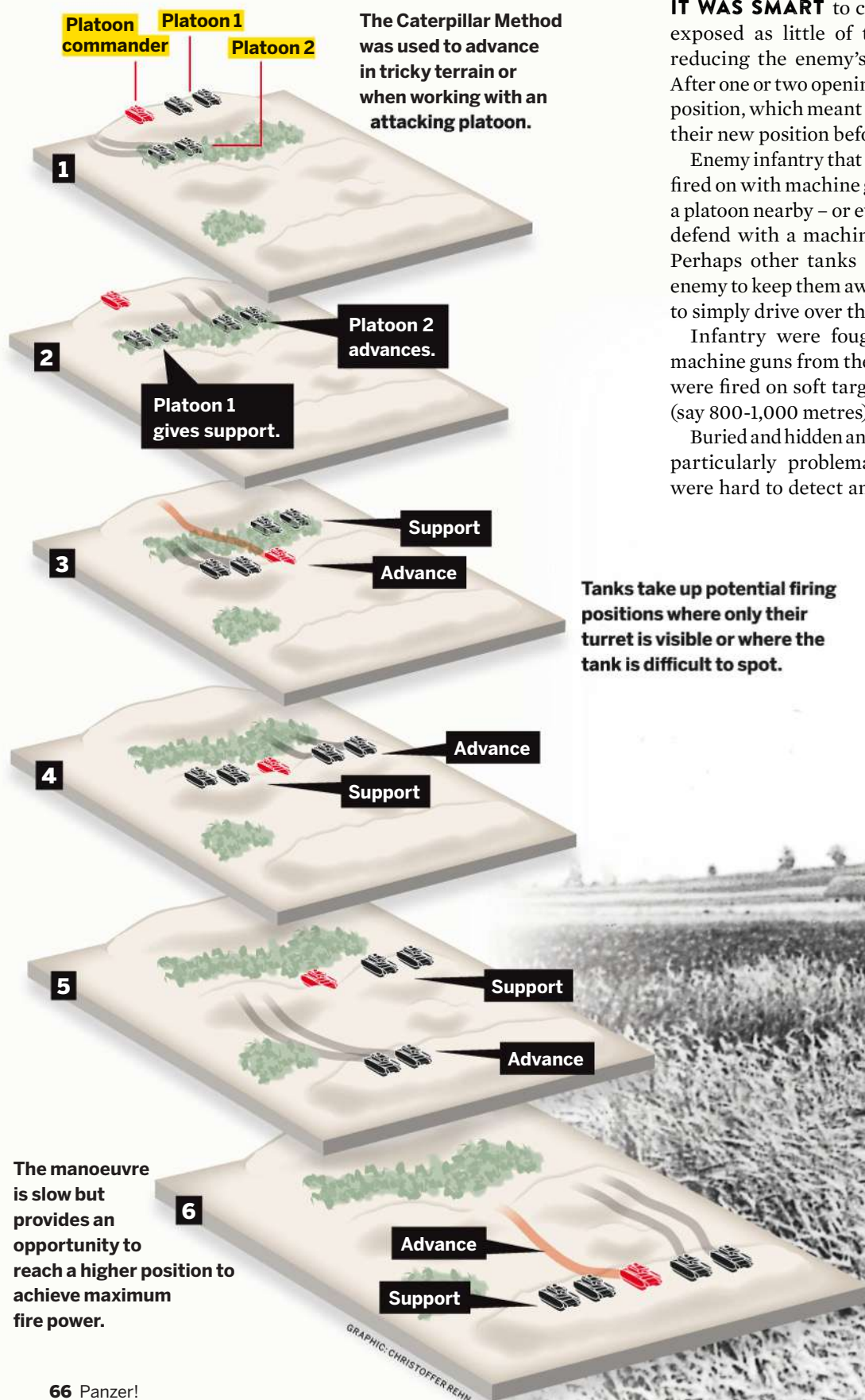
★ The shell caused damage through its shaped-charge action. As it struck, the shell exploded to push the shell forward. It subsequently broke through hollow casing to convert it into a projectile, which was melted and focused into a targeted beam. The explosive pressure exerted allowed it to cut through the armour plating. The projectile had a low velocity and high trajectory, making



it difficult to strike anything other than stationary targets whose distance could be correctly judged.



A German platoon advances on the battlefield



► risk of being discovered was reduced, increasing both survival rates and the chances of getting off the first shot.

IT WAS SMART to choose a firing position that exposed as little of the tank as possible, thus reducing the enemy's chances of striking back. After one or two opening shots, tanks would change position, which meant the enemy had to rediscover their new position before firing at them again.

Enemy infantry that appeared near the tank were fired on with machine guns. If the crew discovered a platoon nearby – or even on the tank – they could defend with a machine gun and hand grenades. Perhaps other tanks could help by strafing the enemy to keep them away. It might even be possible to simply drive over the entire squad.

Infantry were fought with parallel-mounted machine guns from the turret. Explosive grenades were fired on soft targets as well as those further (say 800-1,000 metres) away.

Buried and hidden anti-tank guns were considered particularly problematic and dangerous. They were hard to detect and not easy to combat, since



the surface of the target was small and required ammunition that could pass through the gun shield if the gun was to be hit from the front. In general, explosive shells were used or – in emergencies – armour-piercing ammunition.

TANKS WERE PARTICULARLY effective when attacking in open or relatively open terrain. Their mobility, protection and firepower were well suited in such situations. Their exclusive qualities ensured armoured forces were rarely used for defence. Normally, they would only be handed defensive operations when no other forces were available – for example, they might be used to hold important territory when the enemy had broken through other defences. As soon as other forces were available, the tanks were replaced.

In attack an armoured force tried various ways to neutralise the limitations imposed by the defence. Minefields could be revealed – if at the same time defenders were neutralised so they couldn't shoot back. Blown-up bridges could be repaired or replaced temporarily. There might be shallow waters where tanks and other vehicles could

“TANKS WERE PARTICULARLY EFFECTIVE AT ATTACKING IN OPEN OR RELATIVELY OPEN TERRAIN.”

cross. When attacking, it was important to have crews and engineers available to clear mines and rebuild bridges.

Forests and built-up areas with limited visibility were not good terrain for tanks. Such conditions gave great opportunities for infantry to target the tank's weaker armour at its sides and rear using close-quarter anti-tank weapons and tactics.

Tank commanders who tried to observe the unpredictable terrain via an open hatch could also be exposed to a barrage of rapid gun fire from infantry. This was the main reason for avoiding forested or urban areas as much as possible. If necessary, infantry became responsible for such areas. For a clever and well-prepared enemy however, there ►

This tank crew utilises tall vegetation and buildings to try and conceal its Panzer IV while seeking out the enemy.

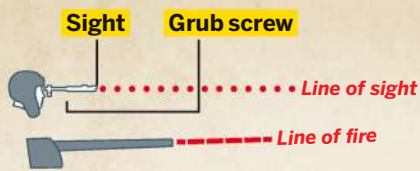
In the background, a light reconnaissance Sd Kfz 222. The Battle of Kursk in July 1943.



SZ PHOTO/IBL

Aim and fire the gun

★ To hit a target at a certain distance, the gunner must compensate for the shell losing height on its way. This is done with a grub screw. The setting is the angle between the line of sight and the gun's core line. The angle changes depending on the type of ammunition and for parallel machine guns.



1 Crew detects an enemy target at 1,000 metres. The sight and gun are usually set to a default setting: for example, armour-piercing shell, 600 metres.

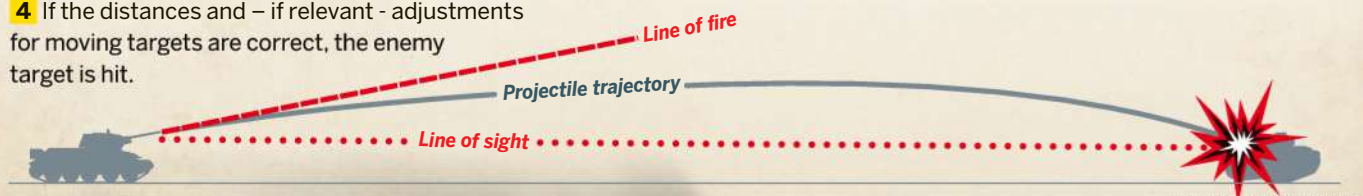


2 The gunner sets the grub screw to 1,200 metres for an armour-piercing shell, which lowers the sight. Its view now shows that the gun is too low for the shell to reach the target.

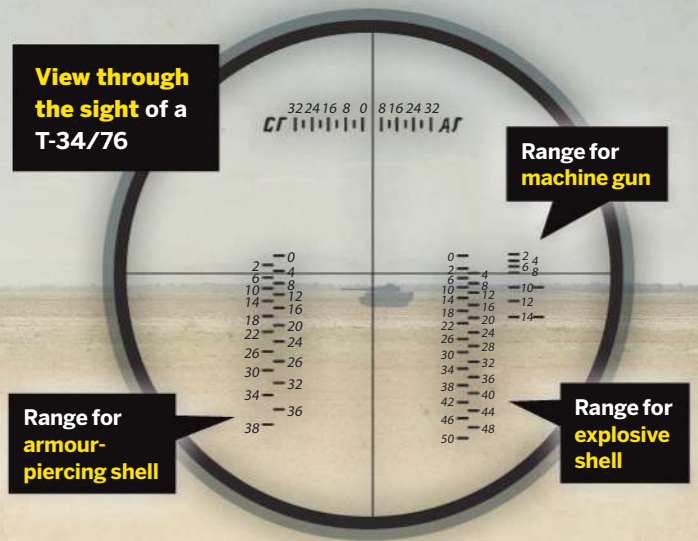


3 When the gunner raises the gun, the sight follows automatically. He continues to raise the gun until the target ends up in his sights. Then the shot can be fired.

4 If the distances and – if relevant - adjustments for moving targets are correct, the enemy target is hit.



GRAPHICS: CHRISTOFFER REHN



This German Tiger's sight shows a burning T-34 somewhere in the Soviet Union in 1944.

► was much to gain by shepherding attacking tanks into terrain where their power could not be fully utilised.

Because tanks were constantly on the move, either in battle or being moved to another location it was important to plan enough time for maintenance. If the maintenance was not carried out, tanks would break down and possibly cause accidents. Fire disruption or engine failure in combat was not something anyone wanted. As soon as there was an opportunity, crew had to check the tank was working in their respective areas of responsibility. Only when the job was done could they eat and rest.

INDIVIDUAL TANKS

A single combat tank with its crew is the smallest independent tank component. That they were well trained and practised was crucial for their success. If one crew member didn't do his job, he jeopardised the lives of everyone else in the tank too. And ultimately it was important in turn for other members of the platoon or company, as well as the on-going operation.

When a crew member discovered a target, it resulted in a series of actions – all of which were well-rehearsed in detail. If the tank who discovered the target could also engage the enemy in question, it was done at the same time as reporting its presence to other tanks.

The tank commander's most important role was to lead the fighting and ensure that the most dangerous targets were fought first and with the right weapon. This he did by giving the fire command, for example: "Gunner, high explosive, anti-tank gun, 900 metres, 12 o'clock, fire when ready". The gunner would swing the turret into position and direct the gun at the correct height to reach the target while adjusting the setup so that the correct ammunition and distance were set (see graphic). If necessary, the loader switched the ammunition in the gun, which took time. In critical duelling situations, the appropriate ammunition was pre-loaded.

AT THE SAME TIME, if possible, the driver swung the tank so that the better protected front faced the enemy. If the tank was being advanced on, he braked slowly and carefully before the shooter fired as soon as he thought he could hit the target. The tank jerked from the powerful gun recoil and if the ground was dry, a dust cloud rose from the ground in front of the vehicle. The tank commander along with the other crew members then tried to note whether the targets had been hit. Armour-piercing ammunition that hit armoured targets

"THAT THEY [THE TANK CREW] WERE WELL TRAINED AND PRACTISED WAS CRUCIAL FOR THEIR SUCCESS"

gave off a lightning glow. The track light gave an indication of where the shot went relative to its target.

IF THE COMMANDER gave no further orders, the loader used the same ammunition. Normally, defending against dangerous targets was repeated until the target was either out of action or assumed to be disabled. If the target was assumed missed, further fire would follow in accordance to memorised guidelines. It was important that the gunner and the turret were sighted on the spot the commander thought was most dangerous. Thus the time between detecting targets and firing was as short as possible. The commander had the best opportunity to observe what was happening, but the others also helped in relation to observation, visuals and other tasks.

In principle, firing would happen while the tank was stationary. If not, results ►

A British sergeant with radio microphone in hand in his M4 Sherman in Italy in 1944. He needed to have his head outside the tank to improve visibility.

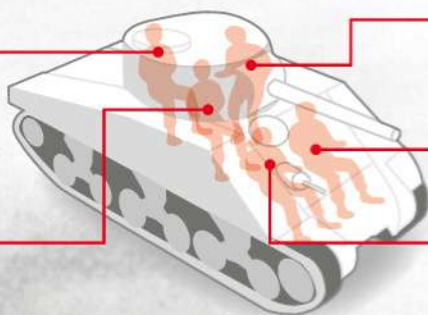


CAPT. TANNER/IMA/GETTY

The duties of a M4 Sherman's crew

Tank commander leads the crew in battle and movement. He observes the platoon commander, other tanks, enemies, terrain and mines; signalling to the platoon commander and other tanks.

The gunner is responsible for armaments and sight instruments. He fires the main gun and turret machine gun on the commander's orders.



The loader oversees refilling ammunition, loading the gun and machine guns, plus operating the radio.

The driver is the tank mechanic and makes sure that everything is working.

The machine gunner is ready with the front machine gun. He's also the reserve tank driver and has the same observation equipment as the driver.

The M4 crew's roles and tasks were similar to other countries' tanks at this time.

GRAPHIC: CHRISTOFFER REHN

► were not guaranteed, except at close range. The tank commander ordered the type of ammunition to be used before entering a battle depending on whether he figured they would be firing on tanks or softer targets.

The machine gunner who normally sat next to the driver in the hull was not managed by the tank commander to any significant extent. His job was to observe the terrain immediately in front of the tank, ready to engage his machine gun if a threat appeared.

In addition to ensuring that the tank was in the right position among the platoon while performing tasks assigned by the platoon commander, observing and giving orders to the crew, the tank commander also had to make sure he understood what other tanks – both in his own platoon and among the

enemy – were doing, what the radio orders or signals from the platoon commander were and report on detected or defeated targets, all while lively radio communication and ambient noise rang in his ears: a rather hectic and stressful work situation.

TANK PLATOON/TROOP

The platoon commander had – like other tank commanders – to lead his own tank, but he also directed all other tanks in the platoon

“IN PRINCIPLE, FIRING WOULD HAPPEN WHILE THE TANK WAS STATIONARY”



using either signalling or radio. He'd also listen to the company commander's radio traffic and continuously report from the platoon to keep his superior constantly updated. In almost every manoeuvre tanks kept about 50 metres apart, to reduce the amount of damage caused by enemy fire and air attack. Tanks and anti-tank guns standing only an arm's length apart are pure fiction from the movies.

A German platoon's most common attack formations were in line or the platoon wedge (*Keil*). The tanks would form into a wedge-shaped formation, with the most heavily armed and armoured vehicles forming the tip and the sides, with the platoon commander at the front in the middle. On each side of him, but about 25 metres behind, came the next two tanks. Behind these were the last two tanks, also 25 metres behind the tanks in front and set to the side. This meant the platoon's width was around 200 metres, with a depth from front to back of around 50 metres. The wedges gave increased firepower at the sides. In line, the width was the same, but there was no depth.

OTHER COUNTRIES' PLATOONS used similar formations. In those cases where the platoons had fewer than five tanks, the width was reduced proportionally. When the platoon advanced within firing range of the enemy, one part was made ready to open fire (see graphic on page 66) while the others advanced.

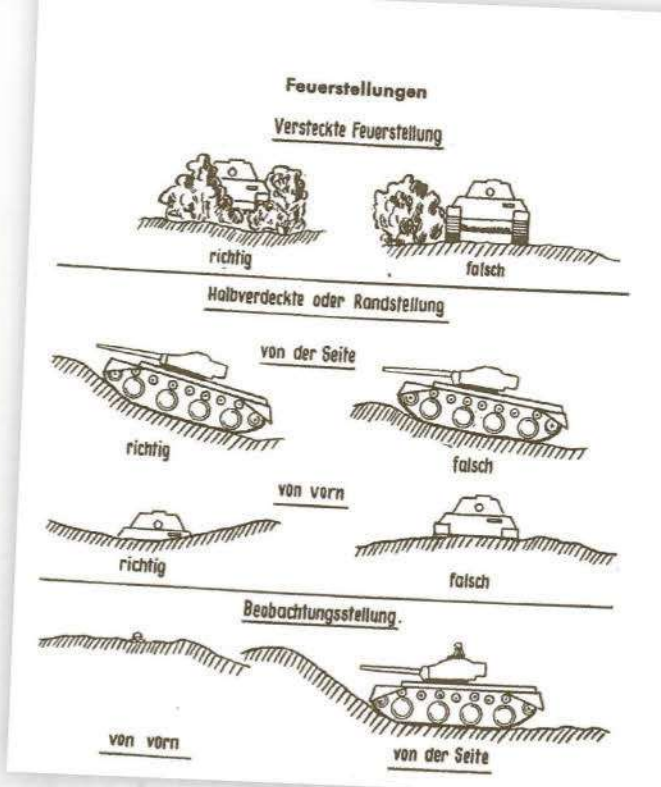
When all or part of the platoon were arranged to open fire during the battle in either attack or defence, the tanks eventually sought positions where the vehicle was exposed as little as possible. As they

prepared for defence, they avoided discovery by hiding tanks outside of firing range while observing the enemy advance.

When attacking, it was necessary to keep up the pace and follow orders. If the platoon commander led the battalion from the front, he had to keep track of where he was on the map. Where was the enemy? Could they make a detour if necessary if they came across impassable obstacles or terrain like blown bridges? All were to be avoided if possible, unless orders dictated otherwise.

Procedures across countries were often similar, emphasised by the fact that the US Army Field Manual FM 17 - 30 *Tank Platoon* from 1944

A contemporary German instruction manual reveals how the commander should choose firing and observation positions.



Line and wedge were common formations when German tanks attacked in open terrain. The distance between the tanks is not drawn to the scale in the illustration.

German tanks in General Gerd von Rundstedt's army advance on the Eastern Front in the summer of 1941, possibly 1942.



TANKS IN BATTLE

- contains images that are identical to those in the corresponding German manual.

TANK COMPANY

The challenges that the company commander faced were the same as battalion and platoon commanders – albeit at a higher level since he led three, four or maybe five tank platoons. In addition, there might be infantry and artillery divisions, support functions and – for good measure – an often-demanding battalion commander.

Companies often used the platoon wedge formation, but paired it with the so-called inverted wedge (*Breitkeil*). With four platoons, it provided an approximate width of 200-250 m and a depth of 600 m. With two additional platoons in the second section, this extended to 400-500 metres wide with a depth of 400-500 metres.

The mission, what was known about the enemy (including its strength), the terrain and the need for firepower at the front were some of the factors that governed the company commander's choice of formation.

EXTENDED JOURNEYS WERE tough on both tanks and personnel, primarily on the driver. The average speed for the force was 10-15 km/h. If the company was being moved over long distances, hopefully somebody higher in command had arranged rail transport. Advancing across terrain was usually significantly slower than by road, but the road quality – to the extent that there were roads – varied across different sections of the front and with the season. Another problem was that as



Badge of the Royal Tank Regiment.

tanks grew heavier, bridges were increasingly a limiting factor.

An important task for the company commander was to ensure the company were fit to fight in the long run. He had to make sure that the soldiers were rested, that there was time for necessary maintenance, that food, ammunition and fuel were available, and that damaged tanks were recovered.

TANK SYSTEMS

To what extent did the tanks and tank forces battle during World War II and how did they impact the outcome of the war? By itself, the tank had no decisive significance – it was by building versatile composite forces with good mobility, good protection where needed and great firepower that made it possible to influence outcomes.

The enormous firepower that quickly ended mobile warfare during World War I, forcing both sides underground in a war of attrition, was now countered by mobile armoured forces that could smash or manoeuvre around defences to head straight to the heart of the battle.

THESE VERSATILE ARMIES offered different kinds of opportunities that in the short term made them practically independent. They comprised forces combining infantry platoons with tanks, reconnaissance and artillery, command units and – last, but not least – supply units providing food, fuel and ammunition.

Armoured forces found themselves part of a larger system where the weakest link set the



A US Sherman tank commander aims his .50-calibre Browning M2 machine gun. This is probably during an exercise since it's not loaded.

Soviet T-34/76 in firing position in Stalingrad in 1942 or 1943, according to the information accompanying the photo.

SOVPHOTO/JUG/GETTY



limitations. The Allies soon caught up with the head start Germany had enjoyed at the beginning of the war with its armoured divisions and blitzkrieg tactics. They simply observed – and learned from – the enemy. This applied to both combat skills and tactics at a lower level, as it applied to the platoon, company and battalion. Technological development also followed the same track.


Towards the end of the war, tank forces became increasingly alike in both construction and appearance – although not identical. The idea that tanks were part of a ‘system of systems’ remains alive and well even today. Their strengths were – and are – dependent on other systems, which together provide opportunities to achieve significantly more than might otherwise be possible.

THE CHALLENGE IS to find the right balance between the various functions – within the financial framework that exists. The basic combat technique and tactics for tanks are largely the same as those used by both sides at the end of WWII. That said, weapons capable of threatening tanks have increased over the years. Helicopters, fighter jets, anti-tank missiles and a host of other weapon systems have contributed to the fact that tanks

“CIRCUMSTANCES REQUIRED TRUST IN EACH OTHER TO CARRY OUT THEIR SPECIFIC TASKS”

are repeatedly referred to as ‘out of date’. And yet they still hang on.

In conclusion, it must be said that those serving in tanks were not men of steel. The situation where four or five men served as different parts of one body in battle was still different from many others.

The circumstances required trust in each other to carry out their specific tasks to the letter. Many were certainly proud to belong to a tank company, and to experience the special feeling when everything worked well, whether in the tank, platoon or company. Tank commander ‘Snowie’, gunner Ken Tout and the other crew of the British M4 Sherman tank who began this story were quite rightly both happy and proud tank soldiers. 

Harald Sonesson is a reserve tank officer and specialist on combat tanks.

Further reading:
By Tank – D to VE Days
(collection 2010) by Ken Tout.
★ **Panzer Tactics**
(2005–2008) by Wolfgang Schneider.

Battle of Kursk 1943

SHOCKING TURNAROUND

**“THE BATTLE HAD NOT DEVELOPED
AT ALL AS THE SOVIETS HAD EXPECTED”**

Just as the Germans seemed on the point of victory at Kursk, the Red Army rallied spectacularly. General Zhukov's skilful **exploitation of the situation** won the battle and kick-started a trail of successful Soviet offensives that the Red Army rode all the way to Berlin.

Text: Christer Bergström



Superior German tanks

★ Comparison table, 77



Loss calculations

★ Different methods, 78



Operation Citadel

★ Detailed map, 80

Shells rain down as Red Army troops advance across the plain alongside T-34 tanks during the Battle of Kursk in summer 1943.

SOVPHOTO/UGC/GETTY

KURSK, 1943



RUDOLF VON RIBBENTROP

Rudolf von Ribbentrop (middle) together with his crew after being awarded the Knight's Cross at Kursk.

Rudolf von Ribbentrop – the son of Hitler's foreign minister Joachim von Ribbentrop – had just turned 22 years of age. Holding the SS rank of *Obersturmführer* (second lieutenant), he was the commander of a tank company in the 1st SS Panzer Division Leibstandarte Adolf Hitler.

It was Monday, 12th July, 1943.

During a week of incredibly fierce battles, the Germans had managed to inch forward a mere 20 kilometres in what was intended to be the new German summer offensive on the Eastern Front, Operation Citadel.

The young lieutenant looked out over the vast, grassy plains from the turret of his tank. Away on the horizon, tree-lined hills overlooked the grassland. On the other side of the high ground was the small community of Prochorovka, and the current position of the Soviet lines.

IT WAS A GREY but warm summer morning and von Ribbentrop was at the forefront of the German division's tanks as they rolled down the hill to start



The battle at Kursk occurred near the border of modern-day Ukraine.

the day's attack. Von Ribbentrop himself was the tank commander of a medium-sized Panzer IV. There had been 72 such tanks in the division a week before; now only 47 remained. These were supported by four heavy Tiger tanks – which were all that remained of the 11 that had started the operation. But both von Ribbentrop's Panzer IV and the mighty Tiger were far superior to any of the tanks that the Red Army could field. This was a reversal of the relative strengths of the two powers on the Eastern Front from two years ago; then the Soviets' tanks had reigned supreme and nothing could beat them.

WHEN HITLER HAD invaded the Soviet Union in June 1941, the existence of the new Soviet tanks – the medium-heavy T-34 and the heavy KV (Kliment Voroshilov) – had come as a complete shock to the Germans. Until then, they had believed that the Soviet forces had only ancient equipment. Instead, it was the German tanks that were outdated: the new Soviet tanks were capable of destroying any German tank at any distance, while the Germans had to close right in on the Soviet steel monsters to have any chance of defeating them. It was only when 88-mm anti-aircraft guns were deployed in ground warfare that the Germans were able to counter the Soviet tanks.

In fact, with their powerful guns, sloping armoured fronts and wide caterpillar tracks, the T-34 and KV provided the blueprint for a new generation of tanks, one which continues to inform tank construction today. For two years, the German ▶

“THE T-34 AND KV PROVIDED THE BLUEPRINT FOR A NEW GENERATION OF TANKS”

✚ Tiger tanks from II SS Panzer Corps roll over the plains during hard fighting at Kursk.



Heavyweight battle tanks

This table compares some of the German and Soviet tanks that participated in the Battle of Kursk. German tanks were superior at this time.

Tank	Weight (tonnes)	Crew	Front armour	Main weapon	Effective range*
✚ Panzer IV Ausf G	25	5	80 mm 90°	7.5 cm KwK 40 L/48	2,000 m
✚ Panzer V Panther	45	5	80 mm 35° = 98 mm **	7.5 cm KwK 42 L/70	+ 3,000 m
✚ Panzer VI Tiger	57	5	80 mm 90°	8.8 cm KwK 36 L/56	+ 3,000 m
★ T-34 mod. 1943	31	4	45 mm 60° = 90 mm	7.6 cm F-34	100 m
★ T-70	9	4	45 mm 30° = 52 mm	45 mm 20K	0 m

* Maximum distance for penetration of 90-mm armour at 90 ° angle.

** The angle of slope on the tank's front armour. The second number indicates effective thickness as a result of the slope.



German tanks:
Panzer IV Ausf G and Panzer V Panther.



Soviet tanks: T-34-85
(model 1943) and T-70.



Tank losses were counted differently

★ The German armoured losses during the Battle of Kursk have been the subject of much debate. Until the 1990s, accounts from Soviet propaganda prevailed, according to which the Germans lost 2,952 tanks and 195 artillery guns. Then the pendulum swung thanks to research based on German archives that demonstrated that the Germans could not have lost more than 278 tanks at the Battle of Kursk between 5th and 23rd July, 1943.

The most in-depth study of the battle to date has been made by American military historian Christopher Lawrence who recently presented his findings in his mammoth book *Kursk*, which first appeared in 2015. Lawrence shows that

the earlier figures, which claimed that the Soviets were losing ten tanks to every German one, was mistaken as the two sides were counting different types of 'loss'.

The Soviets counted all tanks that were put out of combat – including those that could be salvaged and repaired, the German numbers included those that had been lost (either destroyed or captured by the enemy).

Lawrence discovered that by counting the German losses according to the Soviet criteria, von Manstein's force lost 1,536 of his 1,747 tanks and artillery guns between July 5th and 18th. Whereas the Soviet forces opposing von Manstein's Army Group South lost 2,471 tanks and artillery guns in the same period – thus, the two sides' losses were considerably closer.

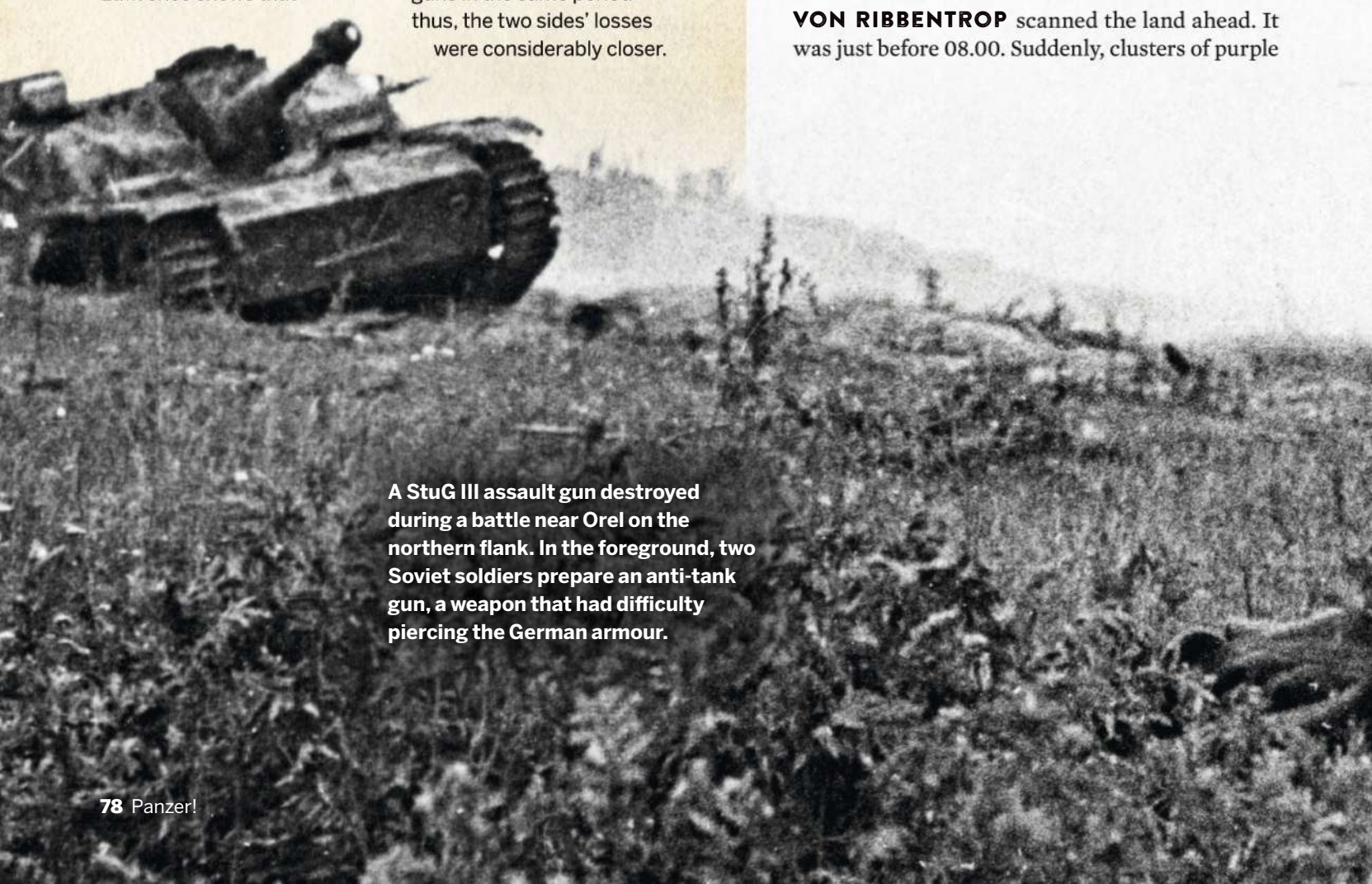
► tank crews cowered before the Soviet machines, believing them to be invincible monsters.

It was in response to the T-34 and KV that the Germans produced two new tanks – the medium-heavy Panther and the heavy Tiger – which gave them a qualitative advantage over the Red Army's T-34s. With their new tank models, the Germans finally had armoured vehicles designed to batter enemy tanks, rather than infantry and bunkers.

The medium-heavy Panzer IV was an old workhorse from the first days of WWII. Originally, it had been used to knock out enemy bunkers and gun emplacements with its short, howitzer-like gun, but with the appearance of the new Soviet tanks, it was modified to take on a new role: armoured warfare. On version G (Ausführung G), the old gun was replaced with a long, 75-mm KwK 40. This was the same type of weapon found on the PaK 40 anti-tank gun, which came into service at the end of 1941. The 75-mm piece was capable of knocking out a T-34 from more than two kilometres away.

The T-34, on the other hand, had to come within a few hundred metres before its F-34 gun was able to penetrate the upgraded Panzer IV's 80-mm thick frontal armour. In addition, the Panzer IV had recently received a TZF 5f (Turmzielfernrohr 5f) optical sight, which magnified objects at 1,200 metres distance by a factor of 2.5.

VON RIBBENTROP scanned the land ahead. It was just before 08.00. Suddenly, clusters of purple



A StuG III assault gun destroyed during a battle near Orel on the northern flank. In the foreground, two Soviet soldiers prepare an anti-tank gun, a weapon that had difficulty piercing the German armour.

Fw 190A.



CHRISTER BERGSTRÖM

Hs 129 B.



Ju 87 G.

BUNDESARCHIV,
Bild 101-655-59/6-04/ROSSE/CC-BY-SA 3.0

The Luftwaffe struck the Red Army with bomb-laden attack-versions of Focke-Wulf Fw 190, Henschel Hs 129s and Junkers Ju 87 'Stuka' planes with upgraded guns.

smoke bloomed over the hill ahead of the German lines. It was the day's signal for enemy tanks. The German tanks grouped themselves into battle-formation, and then they saw them – 800 metres ahead, T-34 tanks coming up from a hollow in the land: a vast, dense metal tide with soldiers mounted on top. The oncoming tanks rolled over the German infantry positions. It was a counterattack by the Soviet 5th Guards Tank Army. It had 615 tanks, including 304 T-34 and nearly 177 of the lightweight T-60 and T-70 machines. Against them stood Germany's II SS Panzer Corps with just under 300 tanks and artillery guns.

THE GERMAN TANK crews were completely taken aback by the vast wave of Soviet tanks. One among them, Wilhelm Roes, remembers feeling like he would choke when he saw the approaching mass.

“WITH A TERRIBLE NOISE, THE GERMAN TANKS OPENED FIRE”

But von Ribbentrop kept a cool head. He knew that 800 metres was the perfect range for their guns. With a terrible noise, the German tanks opened fire and flames rose from several Soviet tanks. The blazes helped the German pilots pinpoint the Soviet tanks' positions. 20 minutes earlier, a swarm of German aircraft had taken off from their forward bases to support the SS troops' advance. Most of the aircraft were fighters: Focke-Wulf Fw 190 with cluster bombs that sprayed thousands of deadly

Article continues on page 82 ►



SOYFOTO/UG/GETTY

Battle of Kursk

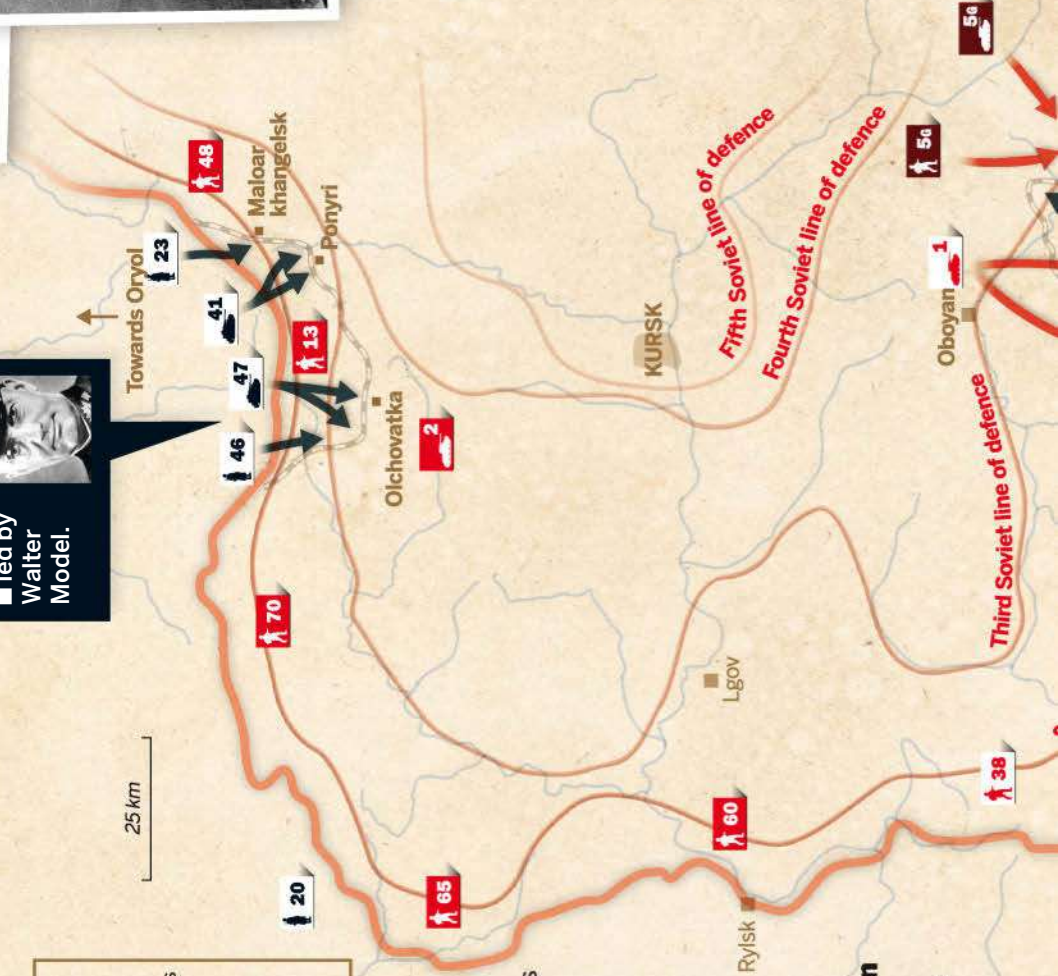
On 5th July, 1943, Germany's 4th Panzer Army, 9th Army and Army Detachment 'Kempf' launched Operation Citadel. It was the last big German offensive on the Eastern Front.



9th Army
led by
Walter
Model.

Legend

German army corps (2-4 divisions)	Soviet armies (7-12 divisions or 2 tanks)
9th Army	corps = 2 German panzer divisions
4th Panzer	
Army Detachment 'Kempf'	Voronezh Front
	Central Front
	Steppe Front



Left: Georgy Zhukov led the Red Army's overall defence at Kursk. Above: Red Army soldiers man a position alongside the corpse of a German soldier.



Northern flank

5th-6th July: attack

At 05.00, the 41st and 47th Panzer Corps attack the first Soviet line of defence. In the afternoon, the Soviet defenders are forced to retire to their second line. The following day, Soviet reserves replace their frontal units. Forces from the 2nd Guards Tank Corps clash with the 41st Panzer Corps at Ponyri and the German advance stalls.

7th-9th July: change of direction

The fighting at Ponyri is going nowhere. The 9th Army changes direction towards Olchovatka. By the evening of 8th July, that advance also falters.

Southern flank

5th-6th July: attack

The 4th Panzer Army launches its attack at 04.00 and later that morning the II SS Panzer Corps makes its first breakthrough. On the flanks, the XXXXVIII Panzer Corps makes slow progress, while Army Detachment 'Kempf' barely moves at all. On 6th July, the II SS Panzer Corps is stopped, causing it to change direction towards Prochorovka.

7th-9th July: change of direction

Both the XXXXVIII Panzer Corps and Army Detachment 'Kempf' make great progress, but the Soviet defenders are still wedged between the three German attack

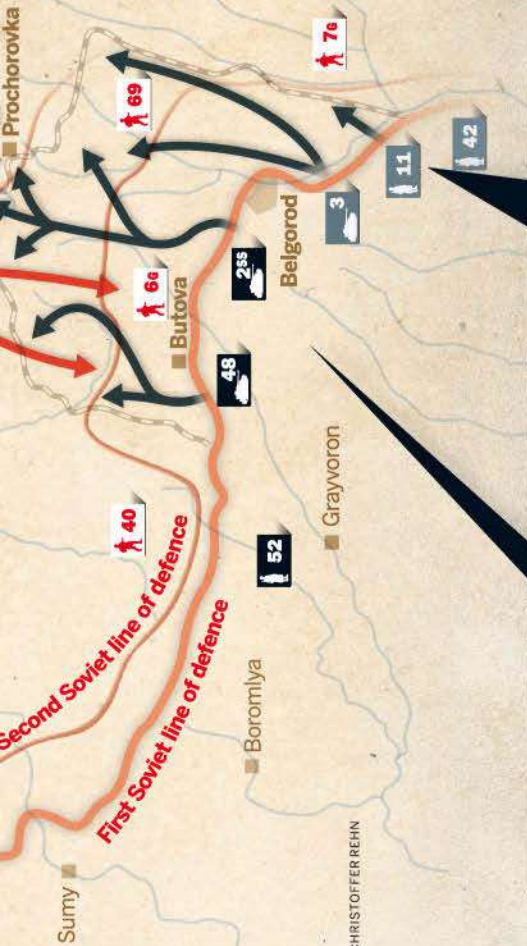
10th-13th July: final showdown

The 9th Army commits its last reserves to the front and the attacks against the heights at Olchovatka resume, but without much success. On 12th July, the Red Army goes on the offensive at Orel, forcing the 9th Army to retreat.



GRAPHIC: ERIK LINDHOLM/CHRISTOFFER REHN
PHOTO: BUNDESARCHIV

Erich von Manstein led Army Group South, which included the 4th Panzer Army and Army Detachment 'Kempf'.



4th Panzer Army led by Hermann Hoth.



Army Detachment 'Kempf' led by Werner Kempf.

formations, threatening their flanks. 1st Guards Tank Army reinforces its frontal forces. On the evening of 8th July, the Germans resume their advance towards Oboyan. On 9th July, II SS Panzer Corp continues its advance on Prochorovka.

10th-13th July: final showdown

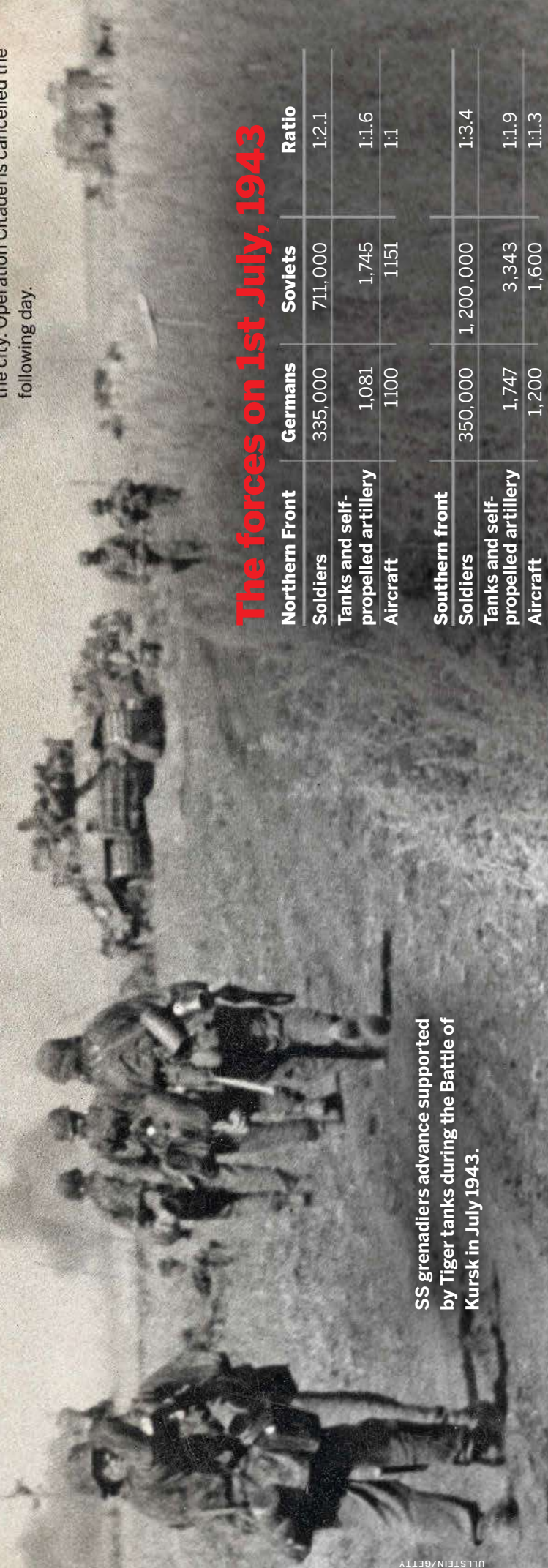
The II SS Panzer Corps destroys the Soviet wedge threatening its flanks, but the XXXVIII Panzer Corps struggles to contain the Soviets on its left and is unable to support the forces nearing Prochorovka. Army Detachment 'Kempf' is also approaching the city from the south east and attempts to close the gap between it and II SS Panzer Corps, but is stopped by Soviet reserves.

To the west of Prochorovka, on 12th July, fierce battles break out between the II SS Panzer Corps and the 5th Guards Tank Army. Elsewhere, Soviet reserves stop Army Detachment 'Kempf' from reaching the city. Operation Citadel is cancelled the following day.

The forces on 1st July, 1943

	Germans	Soviets	Ratio
Northern Front			
Soldiers	335,000	711,000	1:2.1
Tanks and self-propelled artillery	1,081	1,745	1:1.6
Aircraft	1100	1151	1:1
Southern front			
Soldiers	350,000	1,200,000	1:3.4
Tanks and self-propelled artillery	1,747	3,343	1:1.9
Aircraft	1,200	1,600	1:1.3

SS grenadiers advance supported by Tiger tanks during the Battle of Kursk in July 1943.



ULLSTEIN/GETTY

Germany ruled the skies

★ One of the greatest air battles of World War II raged above the soldiers' heads at Kursk. Initially, the Germans had a strong advantage. This was due to several factors. First, the German pilots were generally better trained and, more importantly, had greater experience than their Soviet counterparts – many of those at Kursk came directly from Red Army flying schools. Second, the German fighter planes operated offensively, whereas the Soviets adopted mainly defensive tactics. Third, the German fighter planes, such as the Messerschmitt 109 G and Focke-Wulf 190A, were technically superior to most Soviet models.

During the first day, 5th July, 250 Soviet and 78 German aircraft were lost, that is, a ratio of 3:1. But the Soviet air force adapted surprisingly quickly: on 8th July, the German fighters still had the upper hand, but the ratio

between Soviet and German aircraft losses had fallen to 2:1, and by 9th July, 38 Soviet planes were lost compared to 28 on the German side.

The Soviet's learning curve at Kursk was steep but effective.

German bombers and ground-attack aircraft from both sides offered close air support at the front throughout the battle. There's no reliable data on how many tanks were destroyed by direct air strikes, but that wasn't really the key objective.

The main goal of the air strikes was to immobilise the enemy's tanks by damaging their tracks or engines. Once they were stationary, such tanks could easily be quickly picked off by assault guns.

Below: The Germans' best ground-attack method involved mounting 37-mm guns on their aircraft; Soviet air forces preferred to drop PTAB shaped-charge bombs (see the panel on page 88).

► steel balls in a radius of 100 metres upon detonation, as well as Henschel Hs 129s and Junkers Ju 87s equipped with Flak 37 guns.

The German pilots flying above the battlefield realised that the tanks rolling out of a small wooded grove and from buildings where they had been hidden were Soviet. The planes' guns sounded as the aircraft swept over the Soviet tanks.

Now, a real-life death run started for the Soviet tank crews. They had to travel across up to 1.5 kilometres of open terrain before they could reach the German tanks with their guns and they would be under non-stop fire from the enemy's guns during that time, including from the air.

JUST BEFORE THE battle of Kursk, the *Luftwaffe* (German air force) had formed its first anti-tank ground-attack wing, equipped with twin-engine Henschel Hs 129s and led by Major Bruno Meyer. These aircraft now targeted the Soviet tanks with their semi-automatic anti-tank guns.

The Soviet tanks were defenceless. Rolling over completely open ground, they were so tightly packed that they could not make any manoeuvres as they took the full force of the bombardment.

Soviet tank commander Lieutenant Vasili Bryukhov, who was fortunate enough to survive the tanks' death run over the Prochorovka plains that morning, told author Artem Drabkin afterwards:

The distance between the tanks there was below 100 metres – it was impossible to manoeuvre a tank; one could just jerk it back and forth a bit. It wasn't a battle; it was a





“THE SOVIET’S LEARNING CURVE AT KURSK WAS STEEP BUT EFFECTIVE”

slaughterhouse of tanks. We crawled back and forth and fired. Everything was burning. An indescribable stench hung in the air over the battlefield. Everything was enveloped in smoke, dust and fire, so it looked as if it was twilight. The air force bombed everyone. Tanks were burning, trucks were burning.

FROM THE OTHER SIDE, from the air, the German ‘Stuka’ ace Hans-Ulrich Rudel told how he swept down against the mass of Soviet tanks with his Ju 87 and twin anti-tank guns:

In the first attack four tanks exploded under the hammer blows of my cannons; by evening the total rises to twelve. We are seized with a kind of passion for the chase [and] from the glorious feeling of having saved so much German bloodshed with every tank destroyed.

It had previously been assumed that Rudel’s account stemmed from 5th July, 1943, the day Operation

The Ilyushin Il-2 Shturmovik, which participated at Kursk, was the Soviets’ best ground-attack plane.

German troops advance towards the front at Orel-Belgorod while two Ju 87 ‘Stuka’ planes return from a mission.

Citadel was launched, but the description leaves little doubt that this event played out during the Battle of Prochorovka on the 12th July.

On the ground, Vasili Bryukhov recalled:

If a tank stopped in that battle, you had to bail out immediately. If you weren’t killed by the first round, another tank would drive up and finish you off.

IT’S LIKELY THAT most of the Soviet tanks hit by the German fighter planes weren’t totally destroyed, but the air assault crippled them, leaving them stationary and open to attack by German artillery on the ground. Their numbers were impossible to determine. After just a few minutes, the entire battlefield was ablaze making it difficult for German pilots to assess the impact of their attacks on individual Soviet tanks as they buzzed over the packed battlefield at 250 km/h. However, it’s possible to get some kind of an idea of the destruction when you consider that 53 Hs 129s ►



KURSK, 1943

► had destroyed 84 Soviet tanks a few days earlier. During the Battle of Prochorovka, Fliegerkorps VIII sent in 248 fighter planes and 150 Ju 87 dive bombers against the tanks rolling across the plains.

Reports from the 5th Guards Tank Army announced heavy Soviet losses due to enemy air and artillery activity, but by 10.30, its brigades had reached the Komsomolets State Farm. There incessant air strikes halted their advance as they were forced to take cover.

Among the personal losses was the unit's commander, who was severely injured when his British-made Churchill tank was hit by a German plane.

But while the grass plains were filled with Soviet tank wrecks, the surviving vehicles closed at full-speed with the German tanks until they were in firing range. As von Ribbentrop later noted:

In that instant there appeared at less than 100 m from us...some ten, twenty, thirty and more T-34 tank – at full speed and carrying infantry, coming directly at us. ‘That’s it’, I muttered to myself. We no longer had a chance. Sure enough, both tanks to my immediate right side straight away took hits and were ablaze.

But the gunner in von Ribbentrop's Panzer IV had already fired the tank's powerful weapon and a T-34 was torn apart 20-30 metres ahead of them. More shots followed, taking out two or three more T-34s.

Then the Soviet tanks thundered past – heading for the German rear. Anatoly Volkov, the driver of a T-34 remembers:

The noise, heat, smoke and dust of battle were extremely trying. Despite wearing protectors, my ears were extremely painful from the constant firing of the gun... The atmosphere was choking. I was gasping for breath with perspiration running in streams down my face. It was a physically and mentally difficult business being in a tank battle. We expected to be killed at any second and so were surprised after a couple of hours of battle that we were still fighting – still breathing!

An officer from II SS Panzer Corps directs the new Panther tanks on the southern flank at Kursk.

“HITLER HAD MISJUDGED ALMOST EVERY ASPECT OF THE SOVIETS’ CAPABILITIES”

This was the clash of armour at Prochorovka – the culmination of the German offensive against Kursk in July 1943.

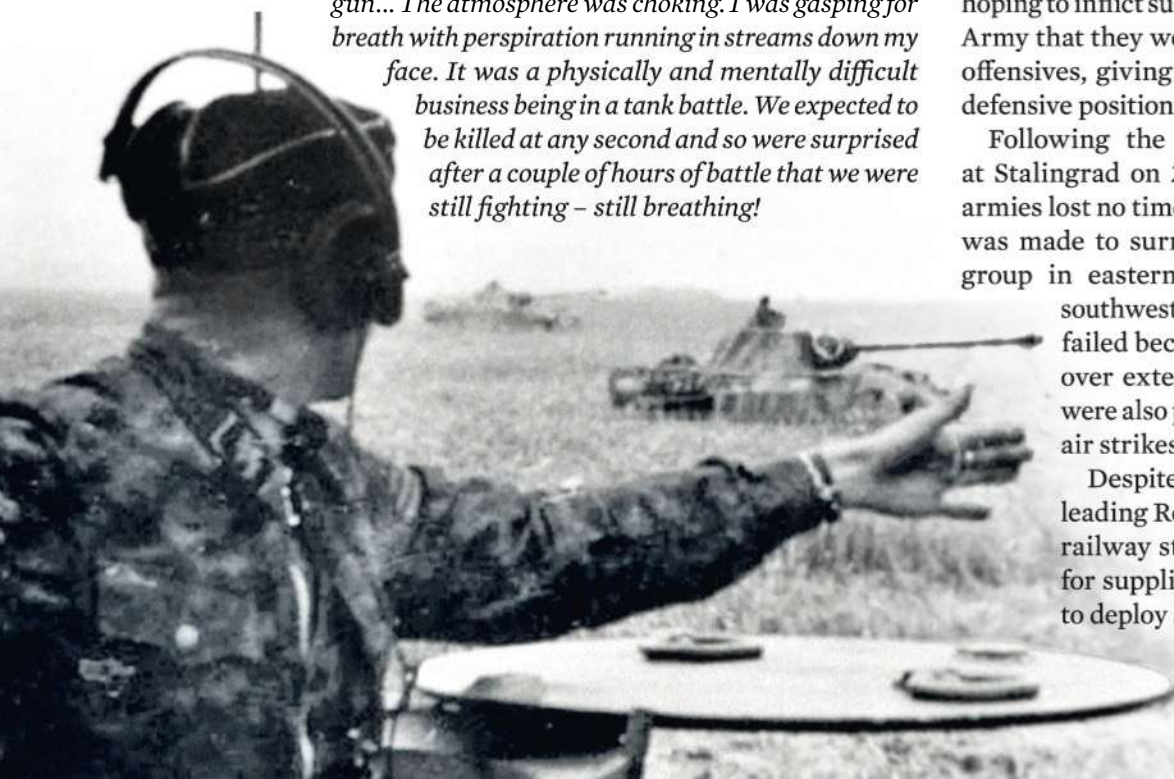
WHEN HITLER DEPLOYED the world's largest invasion force against the Soviet Union on 22nd June, 1941, he had not expected the war to still be raging just over two years later. He had misjudged almost every aspect of the Soviets' capabilities: he had underestimated the resistance of its people and its soldiers, its ability to quickly relocate heavy industry from threatened areas to the distant Ural region, and its military technology – not least its state-of-the-art tanks.

All of this contributed to the historic defeat of the *Wehrmacht* (German armed forces), first in Moscow during the winter of 1941–42, and then at Stalingrad one year later. The destruction of the 6th Army – the *Wehrmacht*'s largest force – at Stalingrad was the turning point of the war. The Germans never recovered from the terrible losses incurred there.

In August 1941, Hitler said that if he had known how strong the Soviet armoured forces were, he never would have invaded. After Stalingrad, he gave up any hope of being able to defeat the Soviet Union. Instead, he focused on defensive actions, hoping to inflict sufficiently heavy losses on the Red Army that they would be forced to break off their offensives, giving Germany time to build strong defensive positions.

Following the surrender of German forces at Stalingrad on 2nd February, 1943, the Soviet armies lost no time in advancing west. An attempt was made to surround an entire German army group in eastern Ukraine by sweeping down southwest from the city of Kharkiv, but this failed because of a lack of air support and over extended supply lines. The Soviets were also plagued by concentrated German air strikes.

Despite the failed manoeuvre, the leading Red Army units came close to the railway station the Germans were using for supplies. This enabled Hitler's forces to deploy a new armoured corps in record ►



German tanks crippled during clashes at Kursk. In the foreground a Panzer III, in the background two Panzer IV (Ausf H) tanks.

LASKI/DIFFUSION/GETTY



KURSK, 1943



Soldiers from II SS Panzer Corps armed with Kar98k rifles advance towards Kursk. A Tiger tank is visible in the background. The photo was taken in June, just before the battle began.

- time. Under the command of General Paul Hausser, the newly arrived II SS Panzer Corps defeated the Soviet's advanced guard, forcing them to withdraw in March 1943 to Kharkiv and Belgorod.

As the snow melted in April 1943, almost all mobile warfare on the Eastern Front ceased – it was the Russian season of *rasputitsa*, a time when unpaved roads become boggy due to thawing snow and ice. So, both sides waited and made plans for the coming summer campaign.

FOLLOWING THE SOVIET offensive and the subsequent German counteroffensive, a 200-km-deep and 260-km-wide salient had developed in the German lines at Kursk, between Orel in the north and Belgorod in the south. It didn't require much imagination to realise that Hitler would attempt a pincer manoeuvre against the Soviet forces inside this so-called 'Kursk Bulge'. On 15th April, 1943, the Nazi dictator obliged. The action was code-named Operation Citadel.

In the south, the Germans had most of Field Marshal Erich von Manstein's Army Group South

in the form of the 4th Panzer Army under General Hermann Hoth and Army Detachment 'Kempf' under General Werner Kempf. Hoth's strongest unit was the II SS Panzer Corps.

ON THE NORTHERN FLANK Germany's Army Group Centre stood. It had grouped two armies into a 150-kilometre deep and 80-kilometre wide wedge at the German-held city of Orel, north of Kursk: the 2nd Army would contain the western side of the bulge, while the 9th Army under General Walter Model would attack south in conjunction with von Manstein. The aim was to surround and annihilate the Soviet Central Front inside the Kursk Bulge. (Army groups were designated as 'fronts' by the Soviets.)

Von Manstein and Model were among the most skilled military commanders of World War II. But the Red Army had its share of talented commanders, too. One was Deputy Supreme Commander Georgy Zhukov. He had organised both the defence of Leningrad and the counteroffensive at Moscow in December 1941. Even the victory at Stalingrad was



BUNDESARCHIV/BLD1011-022-2948-19/WOLFF-PAUL.DR./CC-BY-SA 3.0

One of the many dead at Kursk. German corporal Heinz Kühl was laid to rest on the plains.



LASKI/DIFFUSION/GETTY

Soviet soldiers load a 76-mm field gun during the battle. The Red Army had many more of these guns than the Germans.



ULSTEIN/GETTY

Future Soviet leader Nikita Khrushchev (left) was a political commissar at the Voronezh Front during the battle.

won with a Zhukov strategy. Now he was set to lead the summer campaign in 1943.

Zhukov knew that the Germans would try to attack the Kursk Bulge. However, instead of going on the offensive as soon as the thawing land dried, he proposed building a strong defence within the Bulge. He believed that this would force the Germans to exhaust themselves in a gruelling offensive as they tried to squeeze the Soviet position. Then, once the German force was shattered by its efforts, the Red Army would bring up fresh reserves and hit back in a shockingly powerful counteroffensive. When Soviet reconnaissance and partisan reports confirmed that the Germans were organising a strong force to move against Kursk, the Soviets decided to implement Zhukov's plan.


300,000 CIVILIAN WORKERS were mobilised to build deep defensive works. Nearly 5,000 kilometres of trenches were dug, row-upon-row, reaching 150 km back from the front. Tens of thousands of kilometres of barbed wire were laid out, and a million landmines laid. Anti-tank ditches

“ZHUKOV KNEW THAT THE GERMANS WOULD TRY TO ATTACK THE KURSK BULGE”

and obstacles were created, bunkers were built and artillery positions were excavated.

Initially, Hitler had planned to launch his assault on 3rd May, 1943, but aerial reconnaissance reports showing the extent of the Soviet defensive preparations made him to change his mind. Realising that there was no chance of a surprise attack, he decided to wait until a sufficient number of new Panther and Tiger tanks had been manufactured.

This gave the Soviet forces time to try to neutralise the German aerial threat. Since the first day of the war, when the Luftwaffe had destroyed 1,800 Soviet aircraft on the ground and cut communication to the Soviet main lines, the air force had been the ►

A black and white photograph of a Yak-9B fighter bomber in flight, viewed from the side. The aircraft has a white star on its nose and wing. Below it, a large number of small, dark, teardrop-shaped bombs are falling in a dense cluster.

A Jak-9B, which was developed as a fighter but used as a fighter bomber, drops PTAB bombs somewhere on the Eastern Front.

Tank-buster bomb with a shaped charge

★ PTAB was the designation for the small, 2.5-kg, shaped-charge bombs that the Soviet air force used against German armoured forces. An Il-2 Shturmovik could carry up to 220 PTABs in four bomb-bay folds, and these were dropped in a burst from a height of 200 metres. As a result, they fell with a density of one bomb per square metre, which meant that a single Il-2 could cover an area of 3,000 square metres. If a PTAB hit vertically, it could penetrate armour up to 60-mm-thick. Soviet

investigations of some of the abandoned German tanks on the battlefield showed that the PTAB bombs were quite effective. For example, the Soviets found six Panther tanks from panzergrenadier-division Großdeutschland outside the small village of Dragunskaya, all of which had been destroyed by PTAB bombs which had been dropped from Il-2s. The tanks had all been set on fire by the bombs, which had caused the ammunition to explode in four of them.

► most valuable playing piece on the Eastern Front board. With better technical equipment, superior combat tactics and incomparably more experienced and better trained pilots, the Luftwaffe had gained air superiority in every engagement with the Soviets – with one exception: Stalingrad. Even there, its lack of dominance was due to having to fight at too far a remove from its airfields. As a result, one of the Red Army's key goals at Kursk was to eliminate the German aerial threat.

BEFORE OPERATION CITADEL, the Soviet air force made two attempts to knock out its opponent on the ground – both failed. In mid-June 1943, all available Soviet aircraft were sent to target German airfields. But the formations were detected by German radar before they arrived. The Soviet aircraft were destroyed en masse, while very few German aircraft were destroyed on the ground. (The contention in Antony Beevor's book *The Second World War* that 500 German aircraft were destroyed has its origins in old Soviet propaganda.)

Ahead of Operation Citadel, which was due to start at dawn on 5th July, 1943, the Germans concentrated 2,300 aircraft to support the assault forces, which amounted to nearly 700,000 men. The 3,000 German tanks and artillery guns massed at Kursk almost matched the number Hitler had distributed along the entire Eastern Front two years earlier in June 1941. But the Soviets were prepared. In 1941, they had been at a numerical disadvantage – now they had 1.9 million soldiers in the Kursk

Bulge, along with 2,700 aircraft and 5,000 tanks and artillery guns.

But the battle was not initiated by the Germans, but by the Red Army. At 00.10 on 5th July, 1943, the entire Soviet artillery on the southern flank opened fire on the German lines. Then, with the first glimmer of dawn, a wing of Soviet Ilyushin Il-2 Shturmovik ground-attack aircraft took off to attack the German air fields. This was the second Soviet attempt to neutralise the Luftwaffe before the battle of Kursk.

However, because many of the Soviet air crews lacked experience – for some this was their very first combat flight – they had taken off at daybreak, rather than at night. As a result, the entire German air force was already in the air by the time the Shturmovik planes reached their objectives – where they did so at all. Not only were there no planes left on the ground to attack, but the Soviet aircraft soon found themselves surrounded by large formations of German Messerschmitt Bf 109 fighter planes.

MILITARY HISTORY BOOKS often claim that the ‘air battle over Kursk’ happened at dawn on 5th July, 1943, when the Germans shot down no fewer than 120 Soviet aircraft. This stems from fanciful accounts in the 1960s, in which, without knowing the details, authors marked up all the day’s known Soviet aircraft losses to the morning encounter. The Soviet aircraft losses at dawn were significant – the attempt to neutralise the Luftwaffe on the

“FROM MORNING TO EVENING, HUGE AIR BATTLES RAGED OVER THE BATTLEFIELD”

ground cost the attackers 38 aircraft – but of far greater importance was the fact that the Soviet plan to neutralise the German aerial threat had failed utterly: not a single German aircraft was destroyed on the ground.

From morning to evening on 5th July, huge air battles raged over the battlefield as both sides threw in everything they had to support their own ground forces. German fighter pilots zipped in and out of Soviet formations, decimating them. On the Soviet side, the fighter pilots were hampered by strict orders to act defensively. By the end of the day, the Red Army had lost 250 aircraft to the Germans 74.

THINGS LOOKED DIFFERENT on the ground. The Soviets’ shocking artillery assault prevented Model’s 9th Army from launching its attack at the agreed time. When his troops finally rolled forward at 04.35, two hours behind schedule, they met a well-prepared Soviet defence. At the cost of 7,000 dead, wounded or missing and the loss of one fifth of all its tanks, Model’s force pushed forward a few kilometres. But in the small village of Ponyri, ►

An airplane sweeps over Soviet soldiers advancing across the plains. The soldier on the right is armed with a Degtyaryov machine gun.

TASS/GETTY

A German StuG III assault gun rolls over an anti-tank trench dug by the Red Army to try to stop the German advance at Kursk.



- ▶ three kilometres from their starting point, they were caught in protracted house-to-house fighting, which troops referred to as a “mini-Stalingrad”.

On the southern flank, the Soviet artillery delayed von Manstein’s attack for three full hours. Private Karl Stark, a soldier in the German panzergrenadier-division Großdeutschland described the scene:

We started our second attack by a stand of trees on the edge of a forest. This whole area had been devastated by our dive-bombers and artillery. There were dead people everywhere. We couldn’t take any prisoners. Suddenly, our attack force was met with hostile fire from the flank, followed by heavy artillery. The only thing we could do was throw ourselves flat on the ground. After the first day, one third of the soldiers in my company were dead, one third had been wounded and only one third had survived.

THE BATTLES ON the southern flank on 5th July cost 6,334 dead, wounded and missing on the

German side and 8,483 on the Soviet. According to military historian Christopher Lawrence, who has made the most in-depth study of the Battle of Kursk to date, 400 German tanks were put out of play on this day alone (see page 78).

The orders that Hitler had issued just a few hours earlier made the matter even worse. The Nazi leader claimed that the day’s attack would be the deciding factor, and that victory was needed to convince the world that resisting German forces was futile and to destroy any remaining belief in Bolshevik victory.

The situation on the ground, however, suggested that any opposition to Hitler’s Germany was far from over.

Both sides were suffering terrible losses. On 6th July, a Soviet armoured brigade was ambushed by German Tiger tanks and lost 46 of their 50 tanks. But while this was happening, on the northern flank Model’s attack had stalled. The Soviet air force were beginning to operate with greater efficiency, having learned their lessons from the opening encounters.

Given freer reign, the Soviet fighters protected the Soviet ground forces from air strikes, while Soviet bombers and attack aircraft exerted increased pressure on the German lines.

The battles around the small villages of Ponyri, Samodurovka and Olkhovatka, and on the hills of the northern flank, resembled the desperate charges between the trenches of World War I. German war correspondent Paul Schmidt described how after repeated failed advances one division pushed forward against the odds:

The grenadiers of 20th Panzer Division fought a ... furious battle on 8 July near the village of Samodurovka under a scorching sun. Within an hour, all the officers of 5th Company, 112th Panzergrenadier Regiment, had been killed or wounded. Nevertheless the grenadiers swept through cornfields, capturing trenches and excavating new ones. The battalions melted away.

WHEN MODEL GATHERED his force for a renewed attack on 9th July, the Red Army sent almost 200 bombers and attack aircraft in a concentrated strike against his supply lines – it became the weakest German attack so far: very quickly, Model was forced to abandon the assault.

However, on the southern flank, where the Soviet defensive positions were less formidable, the Germans had more success. After two days of terrible carnage, where von Manstein lost almost a third of his tanks – the Germans managed to push through one Soviet line of defence after another.

The Luftwaffe had concentrated most of its anti-tank ground-attack wing, and reportedly, a formation of Henschel 129 attack aircraft succeeded in defeating a flank attack by the Soviet 2nd Guards Tank Corps on 6th July. Although this account is based solely on data from German sources, the Soviet corps did report that it had been attacked by formations of 40 aircraft throughout the day, and had lost 28 tanks during the same period.

The decisive role played by the Luftwaffe, which is often neglected in many depictions of the Battle of Kursk, is evident from Soviet reports made from the southern flank on 7th July:

The tank attacks were supported by aviation, which bombed our troop dispositions every 5-10 minutes in groups of 60-80 aircraft each. As a result of the repeated attacks, the enemy penetrated the 1st Brigade's front and forced it to withdraw in the direction of Syrtsevo.

Pyotr Kuzmenko, who participated in the battle as an artillery lieutenant with the Red Army, also

“BOTH SIDES WERE SUFFERING TERRIBLE LOSSES”

experienced the German air strikes. According to his account, around 20 aircraft formed a circle in the air and attacked their position one by one. The terrified lieutenant felt like every aircraft was heading straight towards his platoon, a terrible siren sounding as the planes dove towards them. Then the German artillery opened fire. Kuzmenko had taken part in the Battle of Stalingrad, but he had never before experienced such a nightmarish conditions. He lay down in the trench with the rest of the platoon and watched as the German bombs violently tore two guns from the neighbouring battery in to pieces.

SOVIET CAPTAIN Nikolay Tregubov from the 100th Tank Brigade was equally stunned by the ferocity of the fighting. Speaking after the war about a clash on the 7th July with 1st SS Panzer Division ‘Leibstandarte Adolf Hitler’, Rudolf von Ribbentrop’s unit, he claimed that he had never experienced such a massive attack on such a narrow front before or since. He believed that they were attacked by the best SS armoured divisions, who had fought very skilfully and bravely.

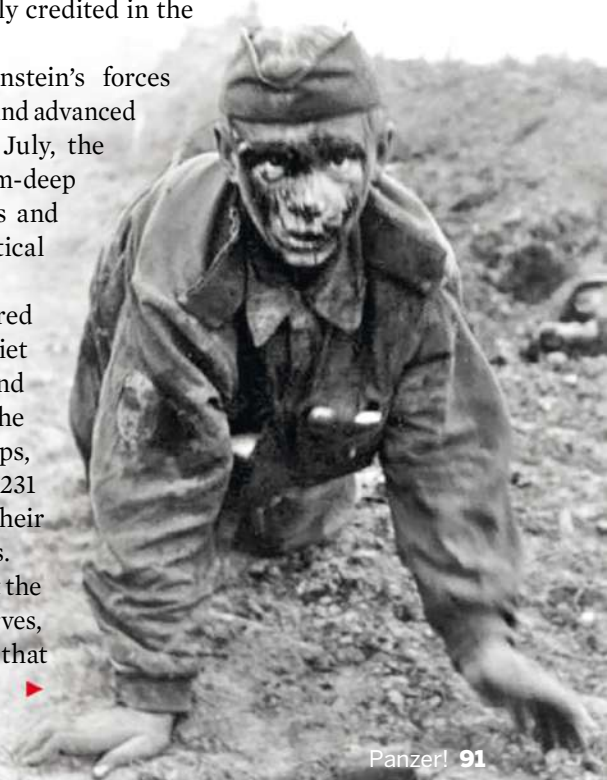
AFTER A BITTER battle, in which the Germans lost 32 tanks and 304 men, and the Soviets 55 tanks and 424 men, Leibstandarte broke through. The Luftwaffe’s support was duly credited in the division’s war diary.

The next day, von Manstein’s forces managed to free themselves and advanced seven kilometres. On 11th July, the Germans had driven a 20-km-deep wedge into the Soviet lines and seemed to have made a tactical breakthrough.

The Germans had suffered hard losses, but the Soviet forces were now broken and bleeding. In the case of the Soviet 3rd Mechanised Corps, the Soviets lost 195 of their 231 tanks and over 5,000 of their 16,000 troops in just six days.

It was at that moment that the Soviets committed their reserves, staging a counterattack that resulted in the tank battle ►

There were thousands of casualties during the battle. Here, a severely wounded Soviet soldier has surrendered and is crawling towards the German lines.



KURSK, 1943

▶ at Prochorovka on 12th July, 1943. That battle ended with a devastating defeat for the Red Army. Three hours of heavy downpours finally came to the aid of the Soviets by making the ground virtually impassable and prematurely ending the battle. By then the 5th Guards Tank Army had lost 309 tanks. The II SS Panzer Corps' losses were limited to 48 tanks, of which 19 were from Leibstandarte. Rudolf von Ribbentrop's tank crew contributed at least fourteen T-34s to the German tally.

The battle had not developed at all as the Soviets had expected. But it didn't matter. Just as the Germans seemed on the point of victory, General Zhukov struck the northern flank: on 12th July, 300,000 men and 1,000 tanks hammered into the German 2nd Army and thus threatened to cut off Model's 9th Army, which was stationed farther east.

This coincided with the Allied landing in Sicily (which happened on 10th July). Hitler realised that the game was up. On 13th July, he gave orders cancelling Operation Citadel and redeployed II SS Panzer Corps to Italy. The 24th Panzer Division were ordered from the south, at Kharkiv, to the northern flank of the Kursk Bulge. In addition, much of von Manstein's air support was transferred to the northern flank.

THANKS TO THE reinforcements that rushed to the northern flank, the 9th Army was able to withdraw in an orderly fashion from the 'Orel wedge', but stripped of his air support, von Manstein's weakened forces couldn't withstand the Soviet counteroffensive on the southern flank, which started on the 17th July. It took the Red Army just five days to recapture all the territory lost during Operation Citadel.

From that point, the Red Army went on the attack on the Eastern Front. On 3rd August, it launched a major offensive against Belgorod, von Manstein's upland area. Two days later, Belgorod was taken, and on 28th August, the Soviet forces entered Kharkiv – it was the fifth and last time the city would change hands in the war. The attack developed into a wide-scale offensive to reclaim Ukraine. Within a month, the entire German force was swept back beyond the Dnieper River (with the exception of a small area in the south).

The German hope to use Dnieper as an impenetrable barrier was dashed when the Soviet forces crossed the river the following winter. 1944 became the year

when the Red Army virtually obliterated the German's forces in the east. Hitler's newly formed units did little more than delay the inevitable end. The Soviet offensive launched at Kursk in July 1943 didn't stop until the red banner was flying over the ruins of the Reichstag building in Berlin on 1 May 1945. The battle at Stalingrad in the winter of 1942–43 was certainly the turning point in World War II, but it was the defeat at Kursk that really signalled the beginning of the end for Hitler's Third Reich. Yet one is forced to concede that the Germans were the battle's tactical and moral victors – at least they were on the southern flank. Although the Red Army commanders were informed about German plans well in advance and had taken phenomenal measures to crush the attack before it could begin, the Germans still managed to break through. For every day that operation continued – until Hitler's decision to cancel the operation on 13th July – their progress was impressive and they succeeded in making ever greater advances.

AT THE SAME TIME, the resistance of the Red Army continually weakened, which is remarkable given that fresh Soviet forces were being constantly inserted into the battle. On 6th July, losses amounted to 1,000 Germans and 2,000 Soviets in the 4th Panzer Army's area of operations. On 7th July, the ratio was 1,500 to 4,500, on 10th July, 1,750 to 9,100 and on 12th July – the day of the Prochorovka tank battle – 1,950 to 17,600!

But the Battle of Kursk was a game of two halves. For Model's 9th Army on the northern flank, things were quite different. Its advance was almost instantaneous, which is remarkable given that the Germans faced a weaker opponent on the southern flank. When Model ended his attempts to break through the Soviet ranks on 11th July, after a week's fighting, 34,000 Red Army troops were dead, wounded or missing compared to 21,000 on the German side – thus, it was a much more even contest than on the southern flank.

One question that comes up time and again is whether it was wise of Hitler to postpone Operation Citadel until the Germans had a sufficient number of the new Panther and Tiger tanks. It is, of course, impossible to answer. If the Germans attacked in May, the Allied landing in Sicily would not have forced Hitler to cancel the operation prematurely. On the other hand, von Manstein's comparative success over Model suggests that it was wise to wait. The former had over 300 of the new medium and heavy tanks, while Model had no Panthers and only 31 Tigers.

ALTOGETHER, THE BATTLE of Kursk, which ran between 5th and 11th July, cost the lives of 45,000

“THE SOVIET VICTORY WAS NOT WON AS ITS STRATEGISTS HAD ENVISAGED”



Germans and just over 100,000 Soviets. There are numerous reasons why the Soviets suffered greater losses, but perhaps the most important of these is the spirit of self-sacrifice that marked the Red Army soldiers. They were fearless in action. This is something to which all veterans from the Eastern Front can testify. At one point during the battle, a German tank fired on a T-34 setting it ablaze. The German tank commander saw the crew jump out, but then one among them, jumped back onto the burning tank, disappeared down through the turret hatch and started the engine. Then he drove the burning vehicle at full speed into a German tank.

In the final assessment, Germany lost seven percent of its initial force, while the Soviets lost only five percent. The materiel losses were greater. Of the 204 Panther tanks assembled on 5th July, only 41 were combat-ready on 20th July. 72 of those missing from the battle line had been destroyed, but on the other hand, the Panther's had taken out 263 Soviet tanks.

The Battle of Kursk differs in one important respect from many other famous World War II clashes. The German losses were high, but not in relation to their overall strength. Proportionally, thought, the average daily losses were higher during the Soviet offensive.

The Soviet victory was not won as its strategists had envisaged, by allowing the Germans to exhaust

themselves in an attack on well-established defensive positions. Nor can the fact that this battle proved to be the beginning of the end of World War II be explained by the redeployment of a single panzer corps to Italy. In fact, out of 281 German divisions, 188 were on the Eastern Front in July 1943 and 186 three months later in October.

For the first time, a major German offensive had been stopped before achieving a breakthrough. The Germans, despite using more technologically advanced armour than in previous years, were unable to break through the in-depth Soviet defences and were caught off guard by the significant operational reserves of the Red Army and this played into the hands of the Soviets.

The Soviet victory was, in fact, down to the skilful way they exploited the situation capitalising on the element of surprise: by putting in a surprising counterattack on the northern flank on 12th July, 1943. The impact of this was that the entire German strategy collapsed which allowed the Red Army to seize the initiative. This, in turn, foreshadowed a new era of well-executed Soviet assaults which completely wrong-footed the Germans. The Red Army had learned from its opponent, after all. 🇷🇺

Christer Bergström has published about 30 books on World War II.

Soviet soldiers counterattack alongside T-34 tanks during the Battle of Kursk.

Further reading:
Kursk – The Battle of Prochorovka (2015) by Christopher A Lawrence ★
Kursk – the Air Battle (2008) by Christer Bergström.

THE ARDENNES, 1944–45

DESPERATE

At the end of 1944, Hitler tried to reverse his war fortunes with a full-out offensive on the Western Front. A **dozen armoured divisions** would advance through the Ardennes towards Antwerp resulting in a huge Allied defeat and give the Germans time to stop the Red Army and introduce their new superweapons.

TEXT: **MATHIAS FORSBERG**

A battle plan was set out by Hitler and the operation was handed to Field Marshal Gerd von Rundstedt, commander-in-chief of the German forces in the West, along with Field Marshal Walter Model, commander of Army Group B. The northernmost element of the offensive would be covered by SS-Obergruppenführer Sepp Dietrich's 6th Panzer Army with Antwerp in its sights. In the south, General Hasso von Manteuffel's 5th Panzer Army would head towards Brussels.

This time, the Germans wouldn't use their classic pincer manoeuvre. Both panzer armies would advance side by side towards the Channel coast. Hitler hoped to repeat the success of 1940 and defeat the Allies by breaking through the middle.

Both von Rundstedt and Model had been sceptical about the plan from the beginning. The Germans lacked experienced crews, fuel and ammunition. In addition, the attack would have to take place under Allied air superiority. It was not possible to launch an advance on such a large scale with such optimistic objectives, they believed, and they had proposed a less ambitious plan that was more focused on defence, but it was dismissed by Hitler, who wanted a large-scale offensive.

The plan was shrouded in uncertainty. Since the panzer divisions lacked enough fuel to advance to the coast, troops were expected to capture US fuel depots en route. Moreover, the attack was reliant on bad weather so that the support transport would not be destroyed by massive Allied air strikes.

The operation also lacked time. It allowed no more than four days to establish a bridgehead on the western side of the River Meuse and the Germans were dependent on the element of surprise if the ►



OFFENSIVE



SS soldiers advance in the Ardennes. In the background is US vehicles and equipment that has been taken. German propaganda photo, 18th December, 1944.

“HITLER HOPED TO REPEAT THE SUCCESS OF 1940 AND DEFEAT THE ALLIES BY BREAKING THROUGH THE MIDDLE.”

NARA

THE ARDENNES OFFENSIVE

► attack had any chance of success. On the US side of the front line, all was calm and peaceful in the run up to the Christmas celebrations. The American forces had gone into winter hibernation and no one believed that the crippled German army was capable of a counteroffensive.

An industrious US liaison officer had warned of signs that the Germans were planning an offensive in the Ardennes, but his superiors dismissed it all and sent him to Paris instead. The Ardennes were considered a quiet section of the front and the US troops were either newly arrived or battered divisions trying to get back on their feet after landing in Normandy.

In the grey light on 16th December, German artillery opened fire taking the Americans completely by surprise. Infantry units from the 6th Panzer Army attacked the US positions paving the way for their armoured units.

Kampfgruppe (Battlegroup) Peiper, named after SS-Standartenführer Joachim Peiper, was the most substantial combat formation. The brigade-sized group began its advance with around 4,800 men and 600 vehicles from the 1st SS Panzer Division Leibstandarte SS Adolf Hitler. Before the offensive Peiper had been doubtful about the operation, but over the course of a single night he'd advanced an armoured column in battle formation for 80 kilometres. He now realised that the plan could be realised – at least in theory.

But Peiper had been delayed before he'd even got started. The initial infantry attacks were timed to perfection yet the armoured vehicles were held up by traffic problems. The battle group became a column over 20 kilometres long as the roadside terrain proved unnavigable. A couple of days snow and cold weather delayed the Ardennes Offensive still further, and when the attack finally began, the temperature was only couple of degrees above zero and sleet had turned the ground to mud. Peiper originally placed his Tiger II tanks in the

vanguard. He soon realised, however, that if such a 68-tonne heavy monster got stuck on a muddy forest road, the offensive would be delayed for hours.

Peiper's battle group did not encounter any opposition until 03.00 on 17th December. During the day Peiper had moved along the wooded roads at a good pace, and the group had advanced around 20 kilometres. The Americans deployed smaller units with reserve soldiers who were quickly defeated. Several columns of vehicles drove straight into the Germans' path and were taken out. At Baugnez, the battle group surprised a transport convoy and captured 92 Americans. An hour after the Germans continued their advance, the prisoners were summarily executed in a war crime later called the Malmédy massacre. During its advance, Peiper's battle group shot and killed over 200 prisoners of war in addition to a number of Belgian civilians.

On 18th December the force continued its move forward and drove another 10 kilometres towards Stavelot. When the Germans approached the town, it was defended by a solitary company from the US 291st Engineer Combat Battalion. The Americans fired with everything they had and Peiper gave orders to stop, believing that the garrison was stronger than it was in reality. Peiper had planned to advance south-west, but with the road blocked he sent his units to the north-east towards Trois-Ponts instead. Stavelot was finally captured on the morning of 19th December.

En route to La Gleize, Peiper's units came across the US 30th Infantry Division, which had assembled along the road to provide the Germans with much stiffer resistance to that from the scattered units Peiper had encountered so far. Worse still, when US relief troops counterattacked at Stavelot and recaptured the town, Peiper suddenly found himself cut off from his support troops. He decided to continue his offensive on 20th December and rely on the following infantry units to reopen the roads.

On the northern front 12th SS Panzer Division "Hitlerjugend" – who had excelled in Normandy – only managed to advance a few kilometres along Peiper's northern flank. In the villages of Rocherath and Krinkelt, the panzer division's front section was stopped by an infantry battalion from the US 2nd Infantry Division. Several attacks were repulsed, and finally the Germans attempted a direct frontal attack with help from a heavy anti-tank battalion.

This failed too, resulting in 30 wrecked tanks. It was only at 17.45 on 18th December that the US troops finally withdrew. There were only 217 men left from the original 600 soldiers in the battalion, but they had held off an entire SS Panzer Division for over three days. The Hitler Youth, who were ►



Civilian men, women and children are murdered as German soldiers move through a Belgian city.

“OVER THE COURSE OF A SINGLE NIGHT HE'D [PEIPER] ADVANCED AN ARMoured COLUMN IN BATTLE FORMATION FOR 80 KILOMETRES.”

Hitler's plan resembled the 1940 offensive

★ The plan for the German offensive in Belgium was to break through towards the Channel coast with two Panzer armies, the same strategy that was used in the invasion of France in 1940. The main objective was the port of Antwerp, which was crucial for the Allies' supply lines. Hitler even believed that an operation where the Germans divided the British and US troops would split the Western Allies and make it possible to bring peace to the Western Front.

German forces

Field Marshal Walter Model's Army Group B would carry out the offensive. Under his command Model had: 15th Army under von Zangen, 6th Panzer Army under Dietrich, 5th Panzer Army under von Manteuffel

and 7th Army under Brandenberger. Student's Army Group H in the north, and Balck's Army Group G in the south did not take part in the offensive.

Allied forces

Commander of the Twelfth United States Army Group was General Omar Bradley. The Army Group consisted of: Ninth Army under Simpson, First Army under Hodges and Third Army under Patton. North of the US forces, the front was held by the 21st Army Group, led by Field Marshal Bernard Montgomery. This group was composed of the First Canadian Army under Crerar and British Second Army under Dempsey.



The operation was codenamed "Wacht am Rhein" ("Watch on the Rhine") after the popular patriotic anthem that gained popularity during the Franco-Prussian War of 1870 and World War I.

Initially, the German's advance progressed. A Tiger II tank rolls past a column of inexperienced US prisoners of war from the First Army. The picture is from the offensive's second day.



THE ARDENNES OFFENSIVE

▶ already behind schedule, had gradually begun to regroup to the south to follow along the same roads as Kampfgruppe Peiper.

In some areas it was quite obvious that the German soldiers had not been adequately trained. The Luftwaffe's reserve personnel were allocated to the depleted *3rd Fallschirmjäger* (Parachute) Division and US troops shot down half a battalion as the German reserves threw themselves repeatedly in unimaginable frontal assaults. US witnesses claimed they'd never seen the German infantry behave so amateurishly.

Initially, there was confusion at the Allies' headquarters in Paris. The question was whether or not this was a big German offensive, and how extensive it was. General Omar Bradley, who led the Twelfth United States Army Group, believed that it was a delaying tactic, but the British, who remembered a similar attack in 1940, warned that this could be a fully developed offensive through the Ardennes. US Commander-in-Chief Dwight D Eisenhower put the only available reserves, the 82nd and 101st Airborne Divisions, on alert and gave them transfer orders. General George S Patton, one of Bradley's army commanders, quickly took charge of transferring armoured units from the US Third Army to the north, a decision that would prove to be extremely far-sighted.

In the south, the Germans had greater success. Von Manteuffel's 5th Panzer Army had carried out extensive reconnaissance putting great emphasis on infiltration. While the SS

"THE ENCIRCLED AMERICANS HELD OUT IN BASTOGNE AND ENDED ANY POSSIBILITIES OF A FURTHER GERMAN ADVANCE."

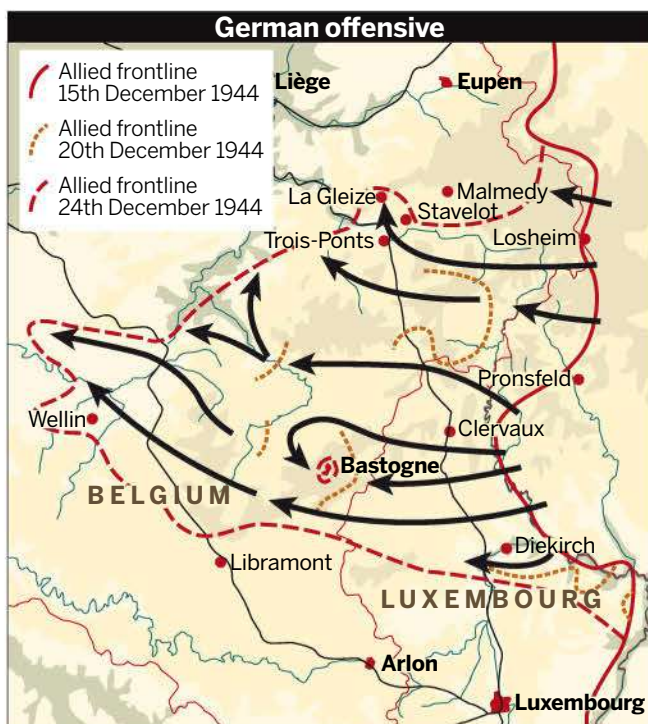
Panzer Divisions advanced, Panzer Lehr and 2nd Panzer Divisions attacked with the skill one was accustomed to seeing from the German Army. In co-operation with the 18th Volksgrenadier Division, the Germans advanced making great progress. On the morning of 18th December, most of the US 106th Infantry Division was surrounded at the same time as the US 28th Infantry Division had been split in two. The next day, almost 9,000 soldiers surrendered, the highest number of US prisoners the Germans had ever taken in a single operation. The Germans had their breakthrough.

An attack was launched on the town of Bastogne, which was a major transport hub with several major roads converging on it. If the Germans took control of Bastogne, it would be easier to defend its southern flank and the foremost units could advance north-east. But thanks to Eisenhower's swift orders, US paratroopers were able to move quickly eastward and by midnight on 18th December, the first paratroopers from the 101st Airborne 'Screaming Eagles' Division dropped into Bastogne. Along with a battle group from the US 10th Armored Division, they established support positions and prepared to face the armoured units with equipment salvaged from the wreckage they had found along the way. Units from Panzer Lehr, the 26th Volksgrenadier Division and the 2nd Panzer Division surrounded Bastogne firing at the city with artillery while the remainder of both panzer divisions rolled further west. After an initial shootout, the Germans sent in a negotiator who urged Brigadier General McAuliffe to surrender. The general refused, exclaiming in response: "Nuts!" When asked to provide a written response, he simply wrote "Nuts!" on a note and handed it to the German, who was forced to ask what the answer meant before returning to the German lines. McAuliffe added, "It's the same as 'Go to Hell' and I'll tell you something else: if you continue your attack, we'll kill every Goddamn German who tries to break into this city".

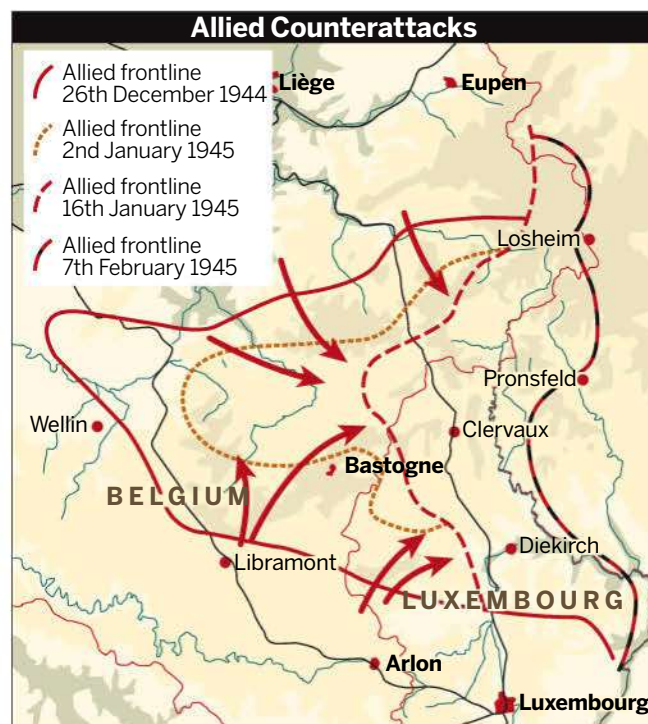
The Germans spent two days attacking the US line and strafing defensive positions with artillery. US supplies were quickly depleted, and the lack of ammunition became a problem. On 22nd December, the Germans attacked, but they failed to advance

US soldiers from the 119th Infantry Regiment surrender to parts of Kampfgruppe Peiper in Stoumont, just south of Liège, 19th December 1944.





In the north, the German attacks soon eased off, but in the south they advanced further. Nevertheless, they failed to overcome the US defence in Bastogne, which was an important hub critical to any further advance.



The Allied counterattacks were led in the south by General Patton and the US Third Army and in the north by Field Marshal Montgomery who commanded the US First and Ninth Armies for a short period.

more than a kilometre, because the muddy ground made it almost impossible to support flanking attacks. Von Manteuffel took a regiment from the 15th Panzergrenadier Division for a major new attack on Christmas Eve, but they also failed to break through the stubborn US defences. The encircled Americans held out in Bastogne and ended any possibilities of a further German advance.

Eisenhower called senior Allied commanders to a conference on 19th December. The situation was chaotic, and Bradley was struggling to effectively command the US First and Ninth Armies. Despite great protests, both were transferred under the command of Field Marshal Bernard Montgomery, commander of the British 21st Army Group. Montgomery ensured that the British XXX Corps was deployed in reserve to help keep control of the bridges over the Meuse.

In the south, excellent preparation combined with a positive fighting spirit among his units allowed Patton to move swiftly towards Bastogne.

Before the Ardennes Offensive, the Germans had planned to create maximum confusion behind US lines using commando units and paratroopers. English-speaking German soldiers in US uniforms would infiltrate US units and create confusion through sabotage. They entered SS

Panzer Brigade 150 under the command of Brigade Commander Otto Skorzeny. He was famous for having liberated Benito Mussolini during a bold mission in Italy in 1943.

The main force of the brigade of almost 2,000 men would use scavenged US equipment and advance on the Meuse as a vanguard ahead of Kampfgruppe Peiper. Because of traffic problems, they hadn't reached the front before Peiper found himself cut off, and Skorzeny requested that they be deployed as a regular unit. He was granted permission, and chose to attack north of Malmédy, where he believed the US defence was weakest. The attack was a complete disaster and the brigade drove straight into well-prepared defence positions on 22nd December. After this, the brigade was withdrawn and dissolved.

Some of soldiers in US uniforms spread disorder, but most were captured and tried as saboteurs. Rumours about them, however, spread and people nervously demanded passwords that only Americans could know, such as the name of Mickey Mouse's girlfriend or the capitals of various US states.

General Bradley himself was stuck in a roadblock where he was asked to name the capital of Illinois. Bradley correctly answered Springfield, but the

★ FACTS

Strength

🇩🇪 Germany

250,000 men

(17 divisions).

1,800 vehicles

of these 600 were tanks.

1,900 artillery

units

including grenade

launchers and

Nebelwerfer

(smoke mortars).

Losses: 91,000

men (16th Dec,

1944–28th Jan,

1945).

🇺🇸🇬🇧 Allies

80,000 men

(six divisions).

830,00 men

in counteroffensive.

425 vehicles

of these 242 were

Sherman tanks.

394 artillery units.

Losses: 89,000

(USA), 1,600 (Great

Britain)..

THE ARDENNES OFFENSIVE

In a last attempt to win the battle, the Luftwaffe massed for a powerful strike on Allied airfields. But at the same time they experienced great losses from both enemy and their own anti-aircraft guns. This picture shows an abandoned "Wirbelwind" ("Whirlwind"), a German self-propelled anti-aircraft gun.



► guard detained him because he thought the correct answer was Chicago.

The airborne operation to support the offensive on the morning of 16th December had to be postponed because of bad weather. Transport planes were able to lift off despite a snowstorm on 17th December, but windy conditions spread the paratroopers over a large area. Only 250 of the 1,300 men in the unit managed to regroup, while most were restricted to reconnaissance and minor acts of sabotage.

Now time was starting to run out for the Germans. In the north, Kampfgruppe Peiper had been cut off since 19th December, and the force was depleted still further after the US 82nd Airborne Division arrived. German attacks on Stavelot to reach Peiper failed, and the diminishing resources soon reached critically low levels. On the night of 24th December, Peiper abandoned all his vehicles, leaving around 300 wounded and 107 US prisoners behind and headed out to the woods on foot. In a week he had lost over 2,000 soldiers and all their tanks. Only 1,000 men returned to their own lines. Nevertheless, his combat group performed better than the other SS Panzer Divisions in the 6th Panzer Army.

To the west of Bastogne Panzer Lehr and 2nd Panzer Division continued towards Meuse. On the evening of 23rd December, the 2nd Panzer Division achieved the offensive's highlight

when units from the division reported that they were only 9 km from Meuse. Hitler cheered, official congratulations were telegraphed from Berlin and everyone expected a breakthrough. But a British Sherman Firefly put paid to their joy. From a hidden position, it took out two Panzer IVs from the front of the 2nd Panzer Division, which rolled towards the bridges. The other vehicles in the patrol hesitated, withdrew and the advance came to a standstill.

The rest of the 2nd Panzer Division was on the edge. It lacked fuel and ammunition. US units flocked to the sector and counterattacks became increasingly intense.

When the US 2nd Armored Division finally arrived with over 200 tanks, the situation became hopeless for the Germans. In the afternoon of 26th December, the division's commander was forced to order a general breakout with remaining units. About 1,500 soldiers and hundreds of tanks were trapped in the cut-off areas. On New Year's Eve 1944, fewer than 700 men had managed to return to the German lines. As their offensive had started to falter, Patton's armoured troops reached Bastogne from the south. At 16.45 on 26th December, the same time as the 2nd Panzer Division's attack broke down at Dinant, a company from the US 4th Armored Division rolled into Bastogne. McAuliffe welcomed the company commander from his Sherman tank and joked with him that the 'Screaming Eagles' hadn't asked for their help. But the battle was not over yet. The air strikes first

began after the ground offensive had reached its climax. The bad weather that had kept Allied planes grounded over the first few days improved on 23rd December and from Christmas Eve onwards Allied planes went on a large-scale attack. The Luftwaffe chose to stake everything on *Operation Bodenplatte* (Baseplate), an attack originally intended as part of the first day's offensive. Instead, the Germans deployed over 1,000 aircraft which attacked Allied airstrips on 2nd January, 1945. The attack went relatively well and the Germans knocked out nearly 500 Allied aircraft, most of them on the ground, while avoiding Allied air strikes.

What the Germans had failed to realise was that the Allies, in spite of their air supremacy, had set up strong anti-aircraft defences near their bases as protection against V-1 flying bombs. Consequently, over 200 German aircraft were shot down. German aircraft were also shot down by their own anti-aircraft defences, which had not been notified of the operation in advance. A total of 280 aircraft were lost. While Allied losses were replaced after just one week, the Luftwaffe's losses were irreplaceable.

In the Ardennes, the Germans began to withdraw their armoured divisions, diverting them to the Eastern Front, where Stalin had mobilised for an offensive on Berlin. Patton suggested that the Allies cut off the bulge by attacking from the rear to surround the German units in the Ardennes. This plan was von Rundstedt's greatest fear, the German commander later admitted, as it was exactly what he would have done in the Allies' place.

Nevertheless, Eisenhower didn't want to take any risks in such a chaotic situation, and he let his forces slowly recapture the Ardennes over a broad front. By the end of January, the front was restored, but the Americans had lost the opportunity to capture the remnants of the German attack groups.

The Germans' offensive with the aim of driving a wedge between the Allies had failed, but Montgomery was close to doing their job for them. He held a press conference where he arrogantly told how he had "handled" the Ardennes offensive and thus indirectly saved the Americans; despite the fact that the British had hardly been involved in the battle at all. Bradley, Eisenhower and Patton were upset and British Prime Minister Winston Churchill was eventually forced to make a public statement to calm the situation.

Although history has – correctly – judged the German Ardennes offensive harshly, there were reasons for supporting the risky operation. The Allies' reserves were strained

“LOSSES ON BOTH SIDES WERE ROUGHLY EQUAL... THE GERMANS COULD NOT REPLACE THEIR PERSONNEL AND MATERIEL LOSSES.”

because most of them had to be transported from bases in Normandy. The port of Antwerp was not opened until 28th November, 1944, and German garrisons retained control of several other important ports in France.

The Germans fought well and successfully advanced 80 km, even though the US soldiers provided good resistance. Losses on both sides were roughly equal, about 75,000 men each. But the Germans could not replace their personnel and materiel losses.

By staking everything on one quick strike Hitler missed out on his last opportunity in an action that had little chance of success. The units lost in the forests of the Ardennes could have been used on the Eastern Front instead, so that the Germans could have evacuated more people before the Red Army's advance. But realising the war was lost and that it would have been better to protect and evacuate civilians were thoughts alien to Hitler. For him it was a simple choice: win or die. ★

Mathias Forsberg is a military historian.

Christmas Eve 1944.
The US military quickly regrouped after the German surprise attack and went on a counteroffensive.



AMG/TTBLOBYRAN

T-54/55

THE WORLD'S TANK

T-54A tanks under the control of opposition group the People's Mojahedin Organisation of Iran roll out during an exercise in Iraq. July 1994.

ANTONIO RIBEIRO/GAMMA-RAPHO/GETTY

Dubbed a Kalashnikov on caterpillar tracks, the T-54/55 had a **robust design**, was easy to learn and maintain, and was above all the world's most widely used tank of its kind. Even today, copies of these tanks continue to roll on to the battlefields in places like Syria and Afghanistan.

Text: **JOHAN LUPANDER**



How to build a tank

★ Design principles, 107.



Explosive protection

★ Active armour, 111.



T-54/55 Specification

★ Graphics, 114–115.



In October 1973, well over a thousand Syrian tanks attacked Israeli positions up on the Golan Heights. One of them – a Soviet-built T-55 – slowly made its way up to the crest of a small dune on skiddy tracks. Its mission was to fire on enemy armoured vehicles from the ridge’s protective slope. Clouds of sand and smoke from the Syrian artillery masked the view towards the summit of the ridge further away, where square silhouettes – the Israeli tank turrets – loomed.

A few seconds later, the tank gunner’s voice could be heard, imploring his driver to move forward. The T-55’s inability to depress the gun more than five degrees below the horizon was causing problems.

Another T-55 nearby also left the protective cover of the slope, only to be struck by what appeared to be a dark red flash, bringing it to a halt before it exploded into flames. An Israeli armour-piercing projectile had penetrated into the combat tower, its white-hot shrapnel detonating the cordite in the tanks’ shells. The entire turret was blasted into the

air, smoke and fire pouring out of the gaping hole left behind.

THE SOVIET T-54 tank and its T-55 variant are history’s most manufactured armoured vehicles with up to 100,000 tanks produced between 1947 and 1983, mostly in the Soviet Union, Poland, Czechoslovakia and China. They’ve been part of – and continue to serve in some cases – the armed forces for around 70 nation states, added to which are a significant number of revolutionary and insurgent movements. As a result, they’ve seen use in most armed conflicts since 1967, although none in North-Western Europe, the area they were originally designed to fight in.

The Soviet Union had already built a combat vehicle manufacturing base during the interwar period, which – initially with outside inspiration and later through hard-fought combat experience – led to the production of the classic T-34/85 tank. It could be considered the best of World War II,



World War II's most successful tank, the T-34/85. Photo from the winter of 1943-44.



The T-44 prototype was the intended successor to the T-34 and had a smaller chassis and thicker armour. It evolved into the T-54.

successfully balancing firepower, armour and manoeuvrability, all within a construction that was geared for mass production.

WHEN THE LATEST German tank types in 1943-44 produced weapons that threatened to render the T34/85's armour protection inadequate, the KB-520 design bureau produced a prototype – the T-44 – with a smaller chassis that could carry thicker armour without increasing the overall weight to a prohibitive level. This was achieved by switching to a different suspension system and removing the co-driver/machine gunner. The T-34/85's turret and its 85-mm gun were kept on with minor modifications.

The gun was soon considered inadequate to meet future needs, and several alternatives with a new turret were developed. An already proven gun with 100-mm calibre from the SU-100 tank destroyer was tried, along with an even larger 122-mm gun from the IS-2 heavy tank and ISU-122 assault gun.

The latter proved to be infeasible, so the choice fell on the 100-mm gun. However, this also caused problems when mounted in the existing cramped turret, which barely provided enough space to handle the larger 100-mm ammunition.

Now the tank received a new, slightly larger turret, at which point it was renamed the T-54-1. Although serial production started in 1947, it was curtailed due to dissatisfaction with the tank's performance in actual service. Both the turret and tank chassis were so cramped that it could carry only 34 rounds compared to the 60-round capacity of the T-34/85. The turret's design was also inadequate because of several so-called 'shot-traps' where grenades might get caught instead of

“THEY’VE BEEN PART OF... THE ARMED FORCES FOR AROUND 70 NATION STATES”

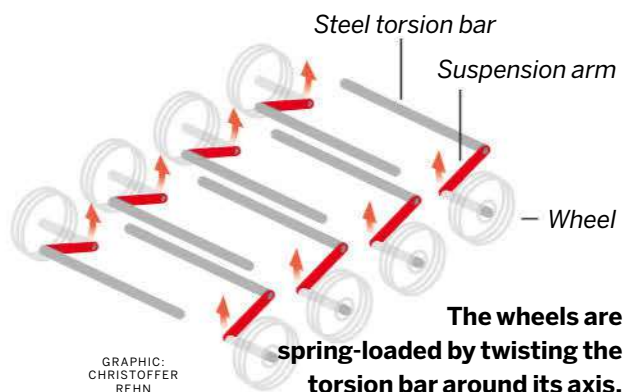
simply bouncing away. Production was therefore halted after around 1,200 tanks. This meant that from 1945-50, the less-than-cutting-edge T-34/85 continued to account for 88 percent of all Soviet tank production.

IF A BRITISH war-time report analysing the T-34 engine is to be believed, Soviet engineers had gained access to drawings and other data for an almost futuristic French aircraft engine in the mid-1920s. From this, a combat vehicle engine was developed that, through gradual refinement, would power almost all heavy Soviet tanks for over 40 years without becoming outdated.

In fact, its mechanical basic design continues to resemble the specifications of a sports car engine: V-12, with engine blocks and cylinder head cast in aluminium, plus dual overhead camshaft. Direct injection was also introduced when the engine was converted to diesel, a great novelty in the 1930s that increased the range of the armoured vehicle while reducing the risk of fire.

When it came to the suspension system, Soviet manufacturers began to use the US Christie spring system in the 1920s, which had several advantages, but was incredibly bulky and took up much space. ►

“IT WAS DECIDED TO HANDLE THE T-54’S SUSPENSION FORCES USING A TORSION BAR SYSTEM”



- A combat vehicle’s suspension system had the job of attempting to even out the bumps in the road surface, particularly when driving off-road. It also had to distribute – in conjunction with the road wheels – the weight of the tank on its tracks more widely to improve accessibility over soft ground.

It was decided to handle the T-54’s suspension forces using a torsion bar system, its suspension element a long steel rod that could be mounted transversely under the chassis, in a U-shape if necessary. One end was anchored to the tank’s body, the other attached to the wheel’s swing arm – as the wheels passed over a bump, the bar twisted to adjust the height of the wheel and reduce the bumpy effect.

DEVELOPMENT OF THE T-54’s protective armour was heavily influenced by the Red Army’s experience during World War II. For the first 18 months of the war on the Eastern Front, the protection offered by the T-34 and heavy KV-1 and KV-2 tanks was enough to negate the effect of German tank and armoured guns except at very close range. At this point, Germans relied on the famous 88-mm Flak gun, along with the ability of their tanks to get into positions whereby they could gain favourable shooting angles.

In 1943, the situation dramatically changed in the Germans favour when the new Tiger and Panther V

tanks went into service, which guns and sights that allowed them to successfully target Soviet tanks from a distance beyond the range of the Red Army’s tank guns. At the same time, Germany upgraded the armour on its other tanks and assault guns. This led to Soviet forces eventually suffering huge tank losses during battles with the German combat vehicles – for example, during the Battle of Kursk in the summer of 1943.

Despite the fact that – with the help of new or modified combat vehicles – the Soviets were able to counteract the German upper hand during the final year of the war, this brief period of inferiority was remembered bitterly, affecting Soviet tank development after the war. As shown in the table below, the designers of the T-54 incorporated armour protection into its final design that was twice as thick as that of the heavy IS-2 tank at critical points.

WHEN IT CAME to designing a replacement for the unsatisfactory T-54-1 turret, the Soviet Army were inspired by the dome-like design of the heavy IS-3 tank’s gun turret, which it considered very successful. Several stages of development saw this evolve into the now-classic shape of the T-54/55 turret: “a bisected egg-shaped turret with the narrow portion pointing forward”, as described by ►

Armour thickness (mm) on selected tanks

Model Country	T-34/85 🇷🇺 Soviet		IS-2 🇷🇺 Soviet		T-54 🇷🇺 Soviet		Centurion Mk 5 🇬🇧 Great Britain		M-48A1 🇺🇸 USA	
Armour	Thickness	Angle	Thickness	Angle	Thickness	Angle	Thickness	Angle	Thickness	Angle
Turret front	90	Rounded	100	Rounded	205	Rounded	165	-	178	50 °
gun protection	90	-	155	Rounded	-	-	200	-	114	30 °
side	75	20 °	90	20 °	113	Rounded	112	-	65–115	Rounded
rear	52	10 °	90	30 °	50–65	Rounded	112	-	25–76	Rounded
roof	15	-	30	-	30	-	30	-	25	-
Chassis front, upper	45	60 °	100	60 °	100	60 °	121	57 °	110	60 °
front, lower	45	50 °	100	30 °	100	55 °	76	46 °	102	35 °
side	45	Ext. 40 °	90–130	9–25 °	79	-	13+51	13 °	-	-
rear	45	45 °	60	41–49 °	45	17 °	35	7 °	35	30 °
Base	20	-	20	-	20	-	16	-	32	-



One of several factors to consider – strategic mobility. Here a British A9 tank is loaded on to a train.

FOX PHOTOS/HULTON ARCHIVE/GETTY

A tank's many requirements

★ A tank is an off-road vehicle, with armour protection that depends on its intended tactical use, as well as armament comprising a main gun and one or more machine guns.

The need for tactical mobility requires that the tank's drive assembly – a continuous track system – first distributes the weight of the tank over the largest possible surface area. Second, its drive train transfers power from the motor to the tracks via a drive sprocket, while the suspension system ensures the wheels remain on the uneven surface while reducing the effects of the bumps and shocks on the tank, its crew, steering systems and other sensitive equipment. The tank's design must also allow it to overcome various types of obstacle

ANOTHER KEY ASPECT is strategic mobility, or a combat vehicle's adaptability to being transported over long distances by rail on flat wagons or by road on tank transporters. Tanks have tried travelling by road over relatively long distances (10 km or greater) but it's fuel-inefficient and wearing on both

the road surface as well as the vehicle's own drive assembly. Rail transport has, of course, superior capacity, but requires the tank can be accommodated within the confines of the railway gauge. This leads to restrictions (3.4 metres in Western Europe, 3.6 metres in the Soviet Union) that forces those tanks that exceed the width of the gauge into a time-consuming process of being dismantled – for example, removing one track assembly with wheels and possible side panels. Conversely, a tank that – without additional measures – could be accommodated within the gauge enjoyed a major practical advantage for rail transport. The T54/55 (3.37 metres wide) was one such example as was the British Centurion tank (3.38 m), but US counterparts the M48 (3.65 m) and M60 (3.63 m) both exceeded the limit.

A TANK'S ARMOUR protection is largely governed by what the designer feels he can allocate to the armour panels within the overall weight restriction. One way to reduce the weight is to construct a relatively small chassis, where thicker panels of armour

can be distributed over a smaller surface area. Relatively low weight also improves mobility and reduces the amount of engine power needed, while a smaller tank is more difficult for the enemy to both detect and target. However, reduced dimensions have serious drawbacks such as less space for both ammunition and fuel, shorter elevation/depression angles for the gun, cramped working conditions for the crew and – something often overlooked – poorer viewing from low-profile tanks.

FOR TANKS WHOSE primary battle role was combat against armoured opponents, a gun with a high muzzle velocity has always been high on the wish list, as this increases both accuracy over longer distances and the effect of armour-piercing projectiles. Such a gun requires a long barrel and is both heavy and expensive to manufacture. Its calibre is limited by the gun's weight, the muzzle's construction and space requirements, and the space available for ammunition. The chassis's width can in turn limit the width of the turret rim and thus the turret itself.

► historian Steven Zaloga. The turret was essentially cast as a single piece, which created a structure that wasn't weakened by welding seams, and which made it possible to gradually thin the armour from the front to the sides and on the roof.

The new version of the T-54 now met the benchmark set by Soviet designers: to be immune at most combat distances from frontal attacks from German and Soviet anti-tank shells produced at the end of the war.

IT WAS AT THIS POINT that one characteristic aspect emerged, set to define the T-54/55 for many years: a continual stream of modifications. One major example in 1951 saw the introduction

of single-axis (vertical) gun stabilisation. Such a system had been installed in most US Sherman tanks during WWII, although it never gained mass approval from its userbase. However, the system was also installed on tanks delivered to the Soviet Union, who gratefully embraced the new technology. Studies suggested that the stabilisation system increased the probability of hitting moving targets from three to 30 percent.

Another innovation – this one probably inspired by the Germans – was the introduction of an infrared driver's periscope and related infrared headlight. Thus – at least theoretically – it was possible to advance in the dark without using normal, visible lighting. Infrared was not, however, good enough to allow target reconnaissance and weapon fire.

DURING THE 1950–53 Korean War, the Soviet Union acquired various technologies from captured US tanks, from which it gained the ability to develop a bore evacuator on the main gun to remove fumes and improve the environment inside the tank. T-54s also received OPVT snorkel equipment allowing them to ford rivers up to five metres deep. Series production finally began in 1955 – it had taken the Soviet Union ten years to produce a versatile modern tank. In the mid-1950s, in comparison with contemporary western tanks, the T-54 could be summarised as having:

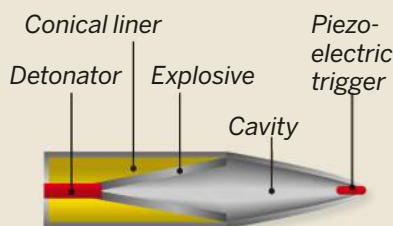
- Superior mobility with wider (580-mm) tracks, a better power/weight ratio, IR driving equipment and deep fording capability.
- Better overall protection thanks to a smaller target area, improved ballistic design of the gun ►



The dome-like turret of the IS-3 became the model for the T-54.

Shells for armoured combat

★ From World War I up to the beginning of WWII, tanks' munitions comprised both high explosive rounds, intended for 'soft' targets like troops and reinforced field positions, and larger armour-piercing shells, intended for 'hard' targets like armoured vehicles and concrete defences. During World War II, two types of armour-piercing projectile were developed along new lines: high explosive anti-tank (HEAT), and the armour-piercing discarding-sabot.



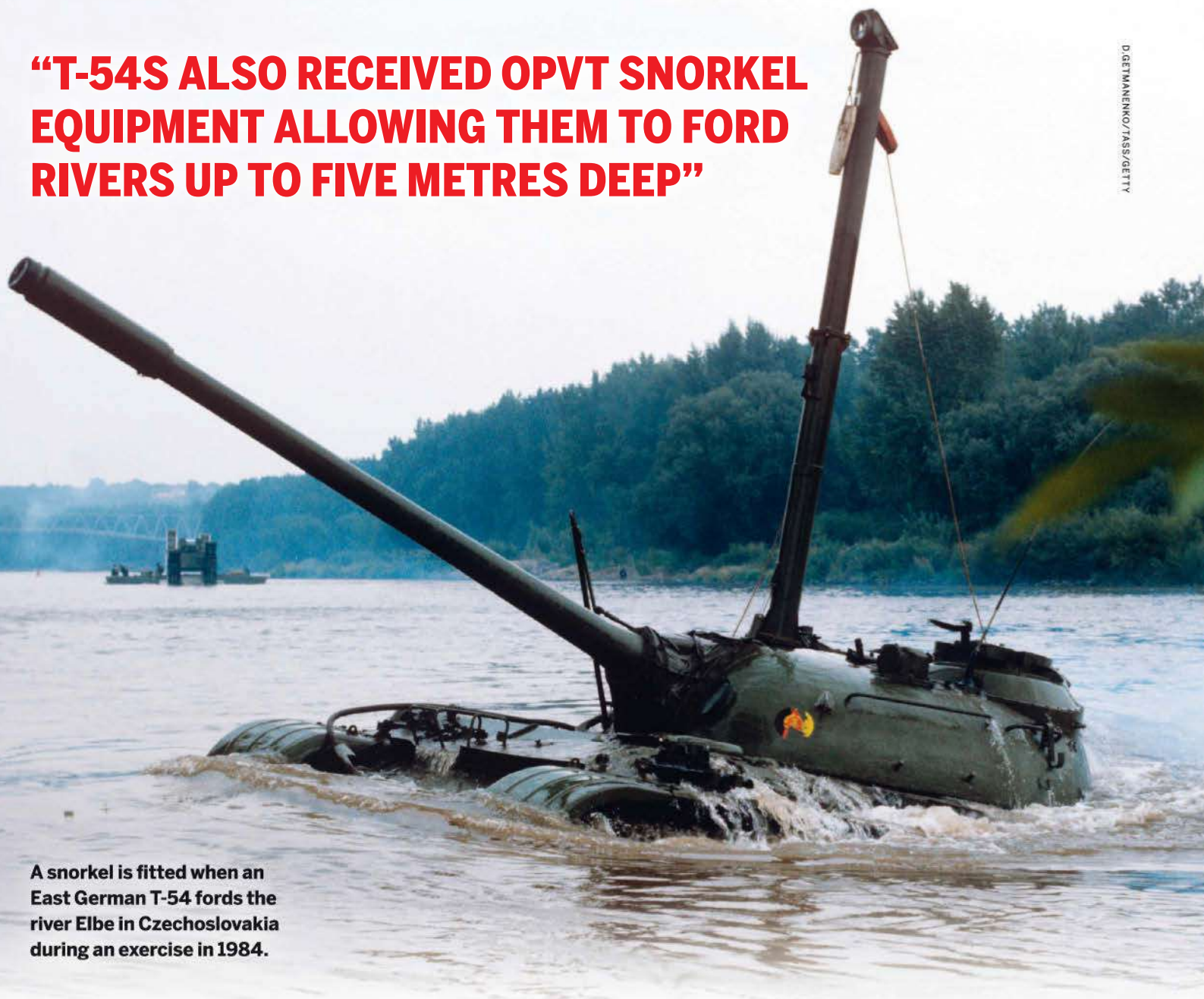
HEAT armour-piercing shell

Shaped charge is a technique designed to direct explosive charges on impact, so their explosive power is focused. In a HEAT shell, the explosive charge was enclosed in a metallic liner, which on detonation collapses into a thin jet of liquid metal, which is pushed forward at incredible velocities (8,000-10,000 m/s), enabling it to penetrate several

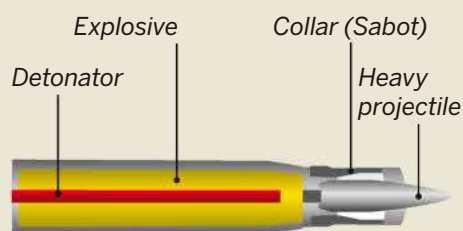
decimetres of armour plating. The big advantage of this technique is that the effect is not linked to the shell's impact energy, and therefore its speed. This meant armour-piercing rounds could be carried and fired by everything from very simple recoilless weapons to tank guns, anti-tank missiles, bombs and artillery submunitions. Drawbacks include losing some of their effect if they're spin-stabilised at firing (some types have countered this by being mounted on ball bearings within the projectile's spinning body), moderate muzzle velocity that limited the shot range and accuracy, and the requirement for high precision manufacture (micrometre tolerance) to achieve maximum effect.

“T-54S ALSO RECEIVED OPVT SNORKEL EQUIPMENT ALLOWING THEM TO FORD RIVERS UP TO FIVE METRES DEEP”

D. GETMANENKO/TASS/GETTY



A snorkel is fitted when an East German T-54 fords the river Elbe in Czechoslovakia during an exercise in 1984.



Armour-piercing discarding-sabot

This sub-calibre armour-piercing round was a British invention that entered service in 1944 in the British Army and consisted of a heavy projectile, preferably tungsten carbide, which was smaller than the gun's calibre and surrounded by a lightweight collar (called a sabot) that filled the barrel.

The total weight of the APDS was significantly less than for a solid shell, so the muzzle velocity was much higher. The sabot fell off after exiting the barrel, whereupon the projectile continued on towards its target. Its higher density in relation to its aerodynamic shape means less air resistance and thus greater range and better armour penetration compared with full-calibre projectiles.

The basic principle has been developed into a longer projectile body with stabilising fins. The projectile's material is tungsten carbide or depleted uranium (Russia and the United States). Muzzle velocities of up to 1,900 m/s have been stated, as well as theoretical penetration of up to six metres of stone.



The photo shows different types of sub-calibre ammunition for the 105-mm L7 gun.

Jubilant insurgents seize control of a T-54A during the uprising in Budapest in October 1956.

SOVPHOTO/UNG/GETTY

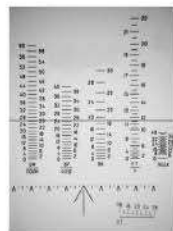


► turret and at least the equivalent armour shielding of its opponents.

- A larger-calibre gun (100 mm versus 84 and 90 mm, respectively), with similar firing velocities for the equivalent ammunition types.

IN SUMMARY, THE T-54 was basically superior to contemporaries in the key properties of mobility, protection and firepower. These advantages were, however, nullified by several shortcomings:

- Limited angles of elevation and depression for the gun, which was a major handicap in the event of combat in prepared positions or battle in urban or hilly terrain.



The T-54's targeting equipment: binocular observation device with periscope.

- The tight space inside the tank did not allow more than 34 (45 for T-55) rounds to be carried. A Centurion could carry 64 (later 72) rounds.

- Until 1969, there was no sub-calibre armour-piercing ammunition for the T-54. Tank crews had full-calibre AP shells, as well as high-explosive anti-tank (HEAT) rounds (see fact box). They had output speeds of 1,050 and 900 m/s respectively, which limited both their accuracy at longer distances and – in the case of the HEAT shell – its penetrative ability. It's likely that the main Western tanks would have been immune to a frontal attack from Soviet armour-piercing shells even at very short distances. In contrast, US 90-mm and UK 105-mm tank guns with their sub-calibre armour-piercing rounds could both hit and strike through the front armour of a T-54 at distances over 2,000 metres. Soviet HEAT shells did at least have the same effect at all distances – if it hit its target.

- The main fire control on the T-54 consisted of a binocular observation device with periscope, which wasn't capable of providing accurate distances to targets. The equivalent US M48 tank, on the other

“INSURGENTS EVEN DROVE A CAPTURED T-54A INTO THE... BRITISH EMBASSY”

hand, had an optical rangefinder that could provide a precise distance if you had time to utilise it. The gauge was connected to a ballistic calculator that provided the correct range. Even with a relatively slow armour-piercing shell, these aids helped the M48 achieve a 50 percent strike rate with its first shot at a target of 1,500 metres distance.

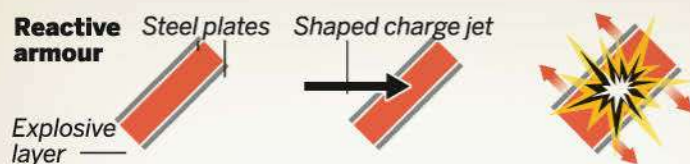
THE T-54'S BAPTISM of fire came in October 1956 when it played a modest role in the Soviet Army's suppression of the Hungarian Uprising in Budapest. Some tanks were knocked out or abandoned after hits from Hungarian anti-tank guns and Molotov cocktails. The insurgents even drove a captured T-54A into the grounds of the British Embassy as a gift to the Western powers, where for several days it was subject to analysis from any experts who could be quickly mobilised. What was most striking was the tank's high level of protection, a finding that accelerated the ongoing development of a new, stronger gun for the Western powers' own tanks. The British gun was designated Royal Ordnance L7, had a 105-mm calibre and from the 1960s was the closest to a standard gun for tanks worldwide.

The T-54 had been designed before the special demands of a nuclear war were known. In the mid-1950s, tests showed the tank's vulnerability to the initial blast and radiation, as well as the residual contamination from the radioactive fallout during and after a nuclear weapon strike.

Because Soviet strategic planning for a future major war in Europe at this time began to include nuclear weapons – from both sides – the need for improvements to mitigate the previously mentioned aspects governed the package of measures being developed. The easy part was sealing the chassis from the initial blast by creating an atmospheric overpressure to keep out radioactive dust and chemical warfare agents, and tanks with these modifications started being manufactured in 1958.

PROTECTION AGAINST ONGOING radiation was more difficult to achieve. A special protective lining called POV was developed – this was plastic impregnated with lead that lined the inside of the chassis. Parts were also mounted on the outside of hatches and hatch combings, enclosed in a thin steel housing. This upgrade entered production in the summer of 1963 and was accompanied by a new filtration system.

The downside was that the tank's interior was even more cramped. In addition, the tank received a modified engine, new gearbox and rearrangement of internal fuel tanks and ammunition storage to increase its capacity to 45 rounds. The price was that ammunition store was now partly surrounded ▶



How reactive armour works: the jet from an armour-piercing shell hits the explosive in the armour to detonate and disrupt the jet to reduce its impact.

Reactive armour disrupts the projectile

★ From the 1950s, armour-piercing projectile (AP) technology had reached the point that APs could usually penetrate the thickest armour in contemporary tanks, albeit to varying effect.

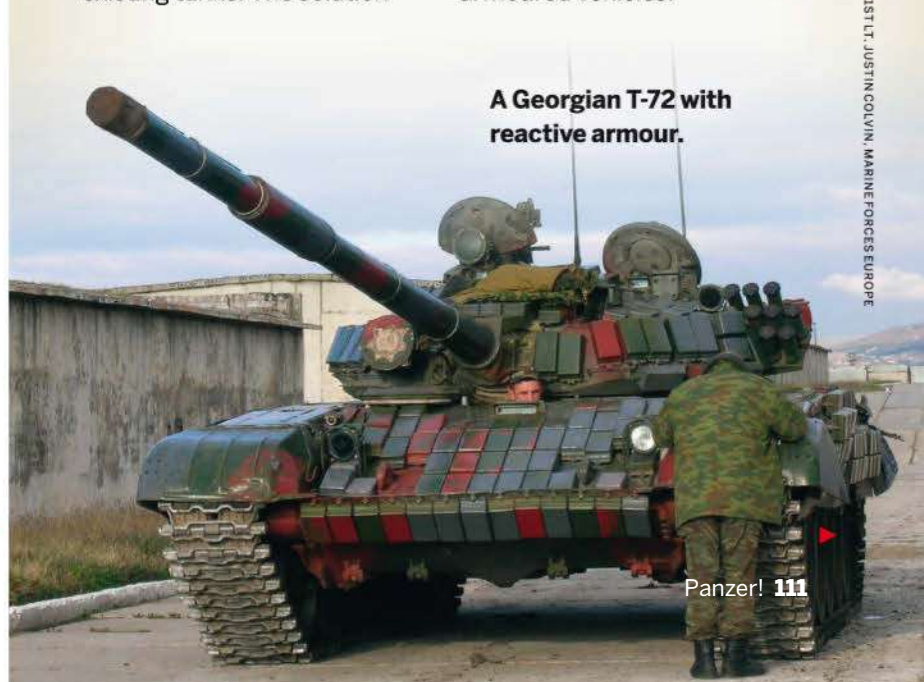
Because APs must be a specific distance from the armour at moment of detonation to penetrate it, combat vehicles were equipped early on with so-called spaced armour, thin panels that were mounted some distance from the tank's sides to cause this type of shell to detonate prematurely. Examples of this type of protection included 'grid shields' around the gun turret (China's Type 69-II) or a heavy grille at the front of the chassis (Sweden's Stridsvagn 103).

What protection designers were looking for was a simple means of interfering with the function of these shells so they could be easily fitted to existing tanks. The solution

they found became explosive reactive armour.

Reactive armour consists of layers of explosive surrounded by thin steel plates that are attached to the exposed surfaces of tanks (front, sides, roof). When the jet from an AP hits the explosive layer, it detonates. Both the explosion and the steel plates disrupt the jet to greatly reduce its impact. Later on, the armour's structure was augmented so that it also has an effect on kinetic projectiles.

This technique's weakness is that once the reactive layer has been hit and detonated, it leaves an unprotected path for new APs, which has been exploited by new dual-charge projectiles. Despite this, reactive armour quickly became very popular – particularly in the Soviet Union – as a simple and relatively inexpensive way to increase the level of protection on armoured vehicles.



A Georgian T-72 with reactive armour.

From iron sight to digital fire control

★ Initially, a tank's guns were aimed using an 'iron sight' mounted on the gun. These were soon replaced by optical rangefinders, which gradually added gradations to aid training crews as well as help determine the distance to a target.

During World War II, stereoscopic rangefinders were added to some countries' tanks. From the 1960s, advances in computer and sensor technology alongside

component miniaturisation enabled the production of fire control systems using laser rangefinders and stabilised gun controls. Their calculators didn't simply account for the distance to a target, but also its movement, current wind strength and direction, chassis shape (and thus gun position), temperature of both air and the ammunition, plus the degree of wear on the gun barrel and gravity-related 'hang'. This greatly increased

the probability of hitting with the first shot, even when firing in motion at moving targets. The opportunities for reconnaissance and targeting, both at night and in poor visibility, improved dramatically through the introduction of sights with passive IR.

Several manufacturing firms – both east and west – competed by offering various systems to equip new or refurbished tanks, including the numerous variants of the T-54/55.

A PLO soldier scans Tripoli in Lebanon from a T-55 during the Lebanese Civil War. He has the 12.7-mm DShK machine gun close to hand. October 1983.

► by fuel tanks, which increased the tank's tendency to catch fire when it was hit. Overall, the changes were so extensive that a new type designation was considered appropriate: the T-55.

UNTIL 1956, T-54 production only took place in the Soviet Union. In 1956, Poland and – one year later – Czechoslovakia gained rights to license production and quickly produced their own variants and modifications. One particular example was Romania, which built 400 T-55s with an extended chassis, new suspension, new German engine and completely redesigned turret.

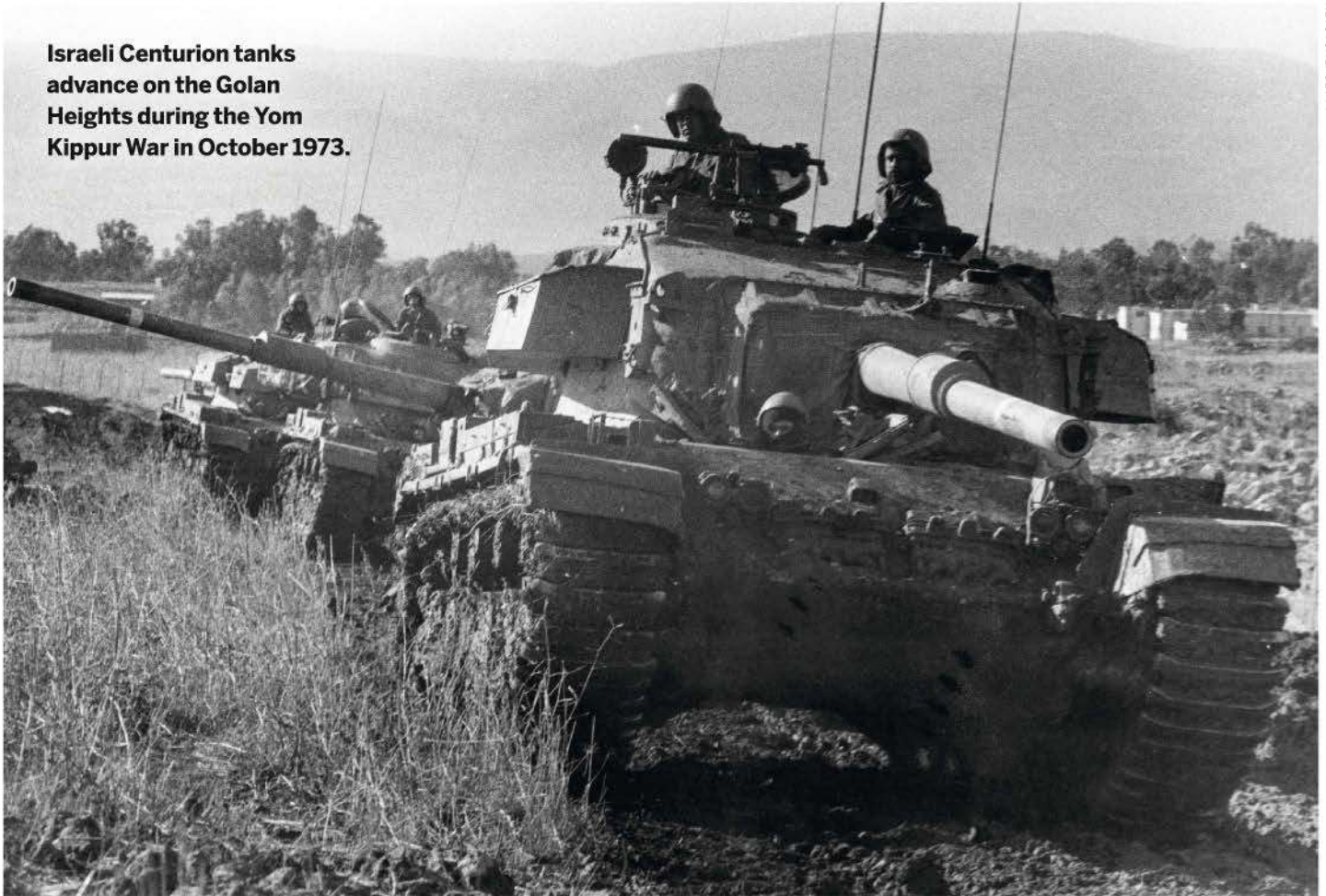
German engine and completely redesigned turret. China became the second largest manufacturer

of the T-54A series after the Soviets, and in 1958 began to produce its own, somewhat simplified T-54A variant under the designation Type 59. It would, with improvements, be manufactured for over 20 years. Inspired by the next Soviet tank, the T-62, an improved variant became the Type 69. It was similar to the T-55 and entered service in 1974.

Until 1982, a modified smoothbore 100-mm gun was developed, which was intended for the Type 69. It apparently wasn't a success, and the Chinese reverted to the old gun, but the tank did receive improved fire control and ammunition as well as so-called "grid shield" protection against HEAT warheads. Pakistan became a major customer of Chinese-made tanks, but their poor durability



Israeli Centurion tanks advance on the Golan Heights during the Yom Kippur War in October 1973.



forced it to build a large tank rebuilding plant for these models as early as 1971.

IN THE SIX-DAY Arab-Israeli War in June 1967, hundreds of T-54s participated on the Egyptian side. Their involvement proved disastrous for the Egyptians, due partly to inept leadership as well as the tank's inadequate armour-piercing shells. Israel's 84-mm and 90-mm guns were able to take out T-54s from a distance of over 2,000 metres, safely out of range of all but a few stray T-54 armour-piercing rounds. Many tanks were abandoned undamaged by their crews.

Egyptian tank losses totalled 373 T-54/55s and approximately 580 tanks of other types. After the war, Israel refurbished and renovated 100 captured T-54/55s, primarily with L7 guns under the designation Tiran. Although pressed into service, they proved unpopular with Israeli crews because of their poorly designed interiors, and were partly assigned as reserve stock, and partly to equip a reserve armoured brigade.

T-54/55 tanks also participated in the latter part of the Vietnam War, mainly as direct support for North Vietnamese infantry. Battles with South

“ISRAEL’S 84-MM AND 90-MM GUNS WERE ABLE TO TAKE OUT T-54S FROM A DISTANCE OF OVER 2,000 METRES”

Vietnamese and US M41 and M48 tanks also took place, with mixed results.

In May 1972, North Vietnamese tanks gained the dubious honour of being the first to be attacked by a new type of anti-tank system: the attack helicopter with TOW-type guided missiles (with semi-automatic control). This proved greatly successful and demonstrated how all contemporary tanks were vulnerable to this new threat.

By far the largest and best known of the T-54/T-55's efforts took place during the Yom Kippur War in October 1973. Syria had built up an army of nearly 1,400 tanks (of which 460 were the more modern

Article continues on page 116 ►

T-54/55

The T-54/55 is the world's most-produced tank. Between 1946 and 1983, up to 100,000 T-54/55s were built. Here we show a Soviet T-55 from 1970.



Commander's sight in the middle and his periscope to the sides.



The driver's seat where two periscopic sights sat above him.

T-55

Dimensions: Length: 9.00 m (including gun). Width: 3.37 m. Height: 2.40 m.

Weight: 40 tonnes.

Engine: Diesel V-12.

Engine power: 500–800 hp depending on version.

Gun: 100-mm rifled, barrel length L/54.

Machine gun: 7.62-mm coaxial mounted, 12.7-mm anti-aircraft gun (selected tanks).

Top speed: 48 km/h on the road.

Fuel capacity: 1,300 litres.

Gun The main weapon was a D-10T 100-mm gun with fume extractor.

Periscope for commander. The commander was seated so close to the gunner he could reach most of his gun controls.

Headlights Both ordinary and shielded for tactical night driving.

Periscope for the driver.

IR searchlight Used in the dark. Another one on the commander's side.

Articulating rod For aligning the gun/searchlight.



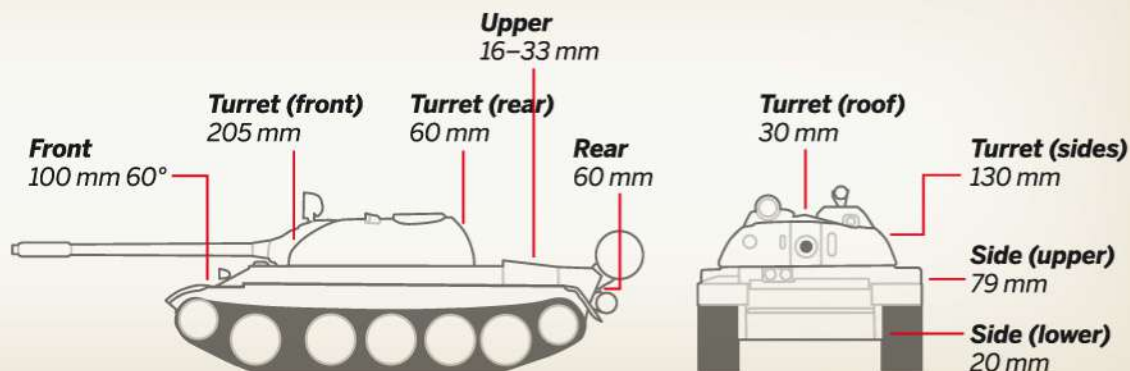
The tank's 45 projectiles are stored in the turret, in the sides of the chassis and in front of the loader.

Stowage bins



Thick and sloped armour

★ The T-54/55's protection was based around sloped armour. It provides better protection than vertically mounted armour, partly because projectiles are more likely to bounce off.



Gunner's sight

MK-4 Periscope for gun loader.

Mount for external machine gun.

Loader's hatch



An opened turret shows how the armour tapers towards the top.

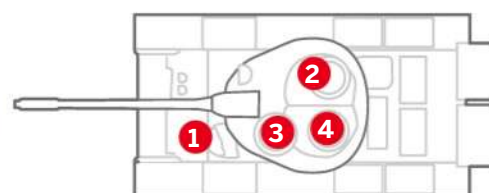
Engine

External armoured fuel tanks
Capacity 2 x 160 litres of diesel.

Gearbox



A North Vietnamese crew pose in front of their T-54 in Saigon in 1975. Below, crew's positions: driver (1), loader (2), gunner (3) and commander (4).



Extra fuel drums

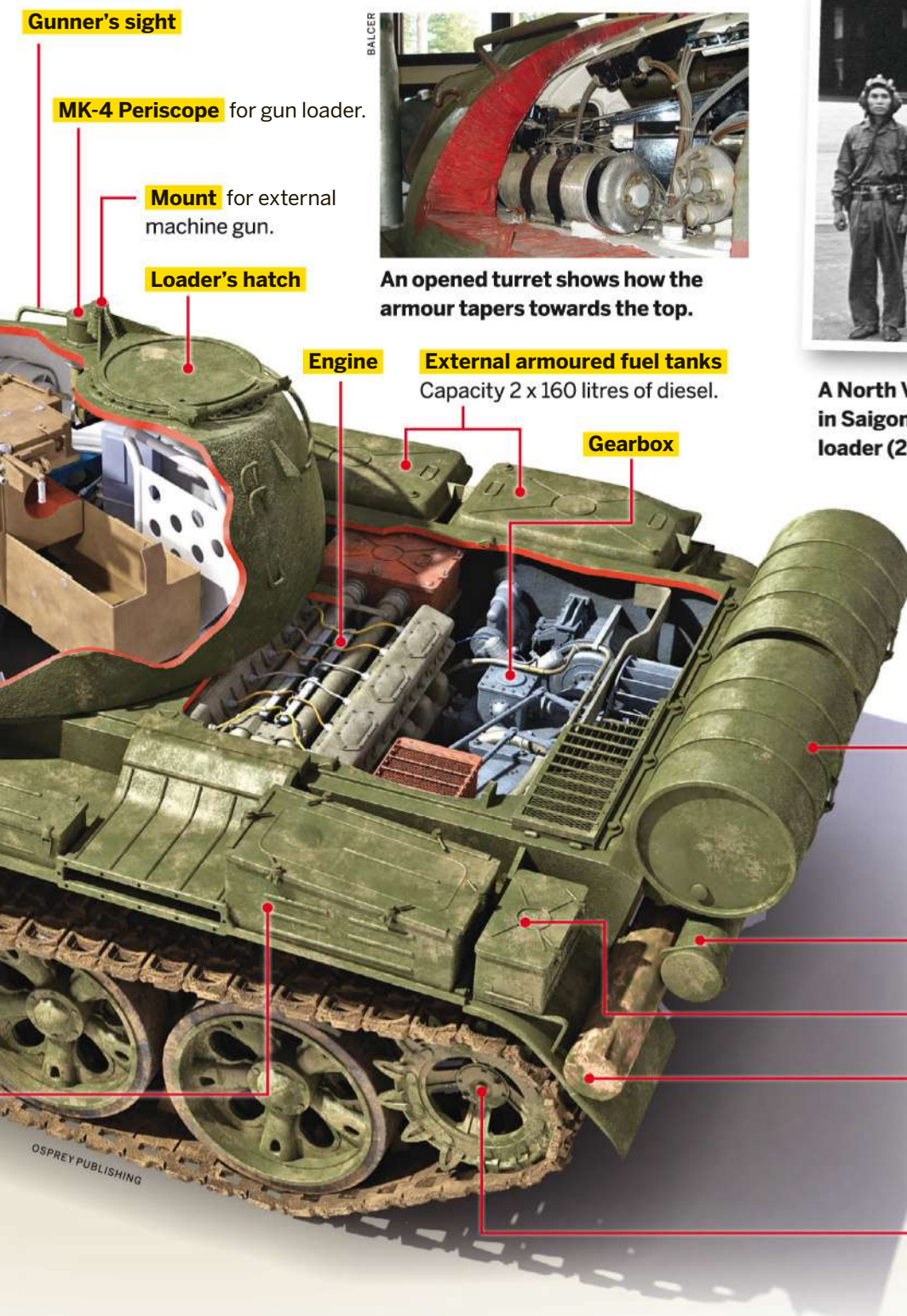
Capacity 2 x 200 litres of diesel.

Snorkel Mounted on the loader's periscope for use while fording deep water.

Rear stowage bin for oil.

Unditching beam One or more. Placed under the tracks if the tank got stuck.

Rear wheels



► type T-62) and applied Soviet mass attack tactics to break through the Israeli defences at the Golan Heights. The armoured forces were supported by a large artillery, including anti-tank guided missiles and rocket-propelled grenades (RPGs).



Israel has controlled the Golan Heights since 1967.

SUCCESS IN THE Six-Day War in 1967 resulted in Israeli political and military leaders becoming victims of their own hubris, particularly with regard to their Arab opponents. As a result, Israel's defences were predominantly tank-based with little spent on mechanised infantry or self-propelled artillery. Support was primarily delivered by the Israeli Air Force, while the Israelis had also neglected to keep track of improvements to the Egyptian and Syrian air and armoured field defences, which included modern Soviet anti-aircraft and anti-tank missiles.

This disdain for its enemy meant that the gradual build-up of Arab forces was largely ignored during the run up to the Yom Kippur weekend in October 1973, and as a result the Israelis failed to take mobilisation measures. One result was that when the Syrians attacked the Golan Heights, the Israeli defences in the area consisted of just two armoured

“DEFENCES... CONSISTED OF JUST TWO ARMoured BRIGADES”

brigades with a total of 177 Shot Cal (modified Centurion) tanks. That said, the Heights' was well fortified with anti-tank ditches, a minefield, barbed wire, reinforced concrete observation and combat strongpoints for infantry and submerged tank firing ramps where only the tank's turret was exposed.

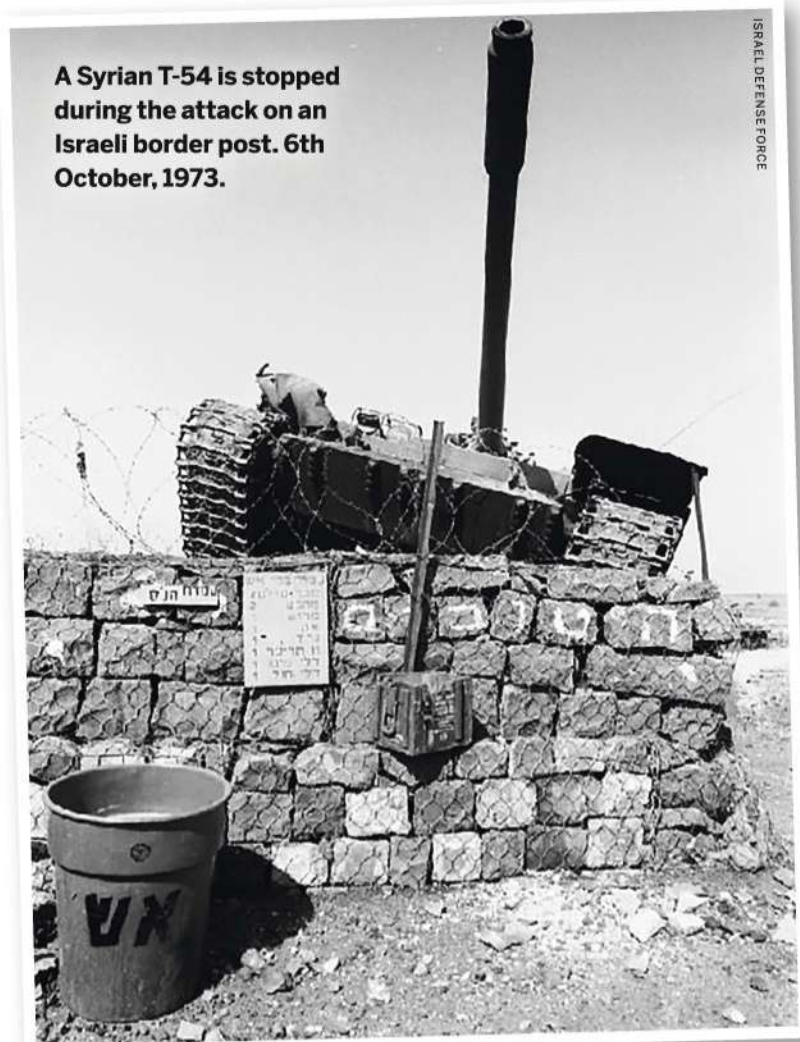
The Syrian battlefield doctrine came directly from the Soviet handbook, which prescribed a frontal assault with a massive armoured force, preceded by an overwhelming barrage from strike aircraft, heavy artillery, guns and RPGs. The armoured units included specialised vehicles for clearing mines, laying bridges, removing obstacles and providing protection against aircraft. Positioned in clusters slightly further back were surface-to-air missiles with the capacity to combat even low-flying targets. The Syrian artillery, however, was still only half that what Soviet doctrine recommended.

THE ISRAELI DEFENDERS were thus able to operate extensively from prepared, protected positions, and – as long as visibility permitted – start striking the advancing Syrian tanks at a distance where the Syrians' own weapons still only had a low strike rate. This battle suited the well-trained Israeli tank crews well.

The initial frontal attacks saw the Syrians enjoy an overall superiority of 8:1 – this was even greater at various pressure points along the line. Individual Israeli Shot Cals took out 30-40 Syrian tanks in under an hour but were then crippled by a shortage of ammunition.

Syrian artillery fire made it both difficult to reload the tanks from the firing ramps, while fresh ammunition struggled to reach them in half-track vehicles. If this failed, the tanks had to risk withdrawing from the ramps to reload several kilometres further back or scavenge from broken-down vehicles.

The Syrian assault continued with grim determination in the face of horrific losses that sparked reluctant admiration from the Israeli side. Gradually, the Syrians' numerical superiority began to have a decisive effect, and the Israeli line of defence was broken or bypassed in several places. A few times during the second and third days of battle, the Israeli rear was actually exposed for a ►



The US M1A1 Abrams tank utilises composite armour technology. Here's an Abrams during an exercise in California, 2003.

U.S. NAVY PHOTO

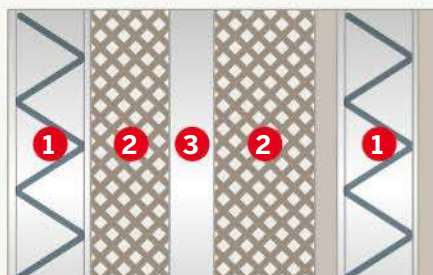


Better armour with composite

★ The battle between projectiles and protection has gone on since antiquity – for example, between throwing stones at fortified walls or between arrowheads and body armour. It took a new turn in the 1960s when the latest materials technology involving ceramics and composites could start to be applied to adding armour to attack helicopters thanks to their seemingly contradictory qualities of hardness, toughness and light weight. The basic principle, however, had been known since 1948.

Historically, protection against kinetic projectiles (which work through force of impact) was primarily to deflect them off a slanted surface. If this failed, the projectile had to shatter or warp, so its kinetic energy was spread over a larger surface area.

The most common way of achieving this was to harden the surface of the armoured panels so that the surface layer became very hard but brittle, while the underlying metal maintained its robustness. This property was then used to stop projectiles or parts of



Here is the principle of how different types of composite armour are constructed: 1 Surrounding layers are an aluminium alloy sandwich with cavities. 2 Next, several inner layers of a ceramic material with a pyramid structure. 3 In the middle, aluminium alloy.

them that had penetrated through the surface layer.

This process of shaping and integrating the treated armour plates into a tank's body wasn't without problems. In addition, weapons technology in World War II had reached a point where armour-piercing shells had penetration capabilities that forced armour so thick and heavy it couldn't be

accommodated on tanks. Composite technology allowed armour protection to be developed with several layers of hard ceramic material alternating with metals of various kinds (the US M1A1 tank used an alloy containing depleted uranium) or with softer ceramics, usually in a mesh that helps disperse and suppress the energy immediately on impact.

Many types of reinforced modules with composite armour have been developed for older tanks, with a reported drastic improvement in their levels of protection.

Although composite armour for combat vehicles was originally developed to protect against projectiles with directed explosive force, they soon developed so that they became almost as effective against kinetic projectiles. Unconfirmed data claims a level of protection (equivalent thickness to steel armour) for the turret front of 95 cm against kinetic projectiles and around 140 cm against armour-piercing shells for the latest variant of the main US tank, the M1A2.

The T-54/55 has participated in battlefields around the world. Pictured is a T-55 during the Libyan Civil War of 2011.



► few hours to a resolute Syrian follow-up attack, but it never came.

Syrian units were stopped in fierce duels or halted by their own senior commanders: “I see the whole Galilee in front of me. Request permission to proceed,” said one tank commander. His request was denied.

AT THIS POINT Syrian High Command made a fatal error – deciding to invest their reserves to force a breakthrough where all previous attacks had been repelled instead of building up their forces where the resistance had given way. “Thus, the Syrians were reinforcing failure in the north rather than their success in the south”, as historian Simon Dunstan put it. Israeli defences proved resilient, its tanks continuing to take up positions in the firing ramps, with repair teams risking life and limb to repair and rearm tanks so they could stay in battle.

Once night fell, the Soviet-built tanks had a potentially decisive technological advantage: a means of fighting in the dark. They were all equipped for night-time driving with the help of IR headlights, but a significant number had also been equipped with an infrared sight for the gunner, which allowed fighting in the darkness with IR revealing targets up to 800 metres away. The Israeli tanks had no such equipment, so relied on their own headlights and battlefield illumination through flares from their own artillery. Unfortunately, the availability of such ammunition was so scarce that it was exhausted in the first night of battle.

Although the Syrians possessed this critical advantage, its exploitation required training in its technical and tactical use along with a willingness on the part of high command to give night war a more prominent role in the battlefield doctrine.

IN BATTLES WITH limited visibility – whether through darkness or dust – it was critical to see the enemy first and start shooting as soon as possible. The reduced distances rendered rangefinding redundant. If the Syrians possessed an – unused – advantage with their IR equipment, the Israelis now benefited from the Shot Cal tank commander’s fold-up sight, which allowed them – independently of the gunner – to train the gun on a target. If further adjustments weren’t required, the commander could fire the gun himself.

This allowed Israeli tanks to fire against unexpected targets in a much shorter time than was possible with a T-54/55. Close-range fighting at night saw the Israelis briefly use their tanks’ regular headlights to illuminate the surrounding area, open fire, extinguish the lights and then move off. It’s fair to say the Syrian tank crews had received no training or practice in exploiting their technological advantage, while the Israelis had learned through experience how to compensate as far as possible for their disadvantage.

To get the best possible view, many Israeli tank commanders chose to fight with the turret door open, standing up with their heads or even their entire upper body exposed. This provided them

Anti-tank missile is fired from main gun

★ Experience gained from the Yom Kippur War demonstrated that the T-54/55's 100-mm gun, even with the latest sub-calibre rounds, wasn't nearly adequate for the predicted resistance and combat distances in Northern Europe.

Therefore, an advanced anti-tank missile was developed for this gun, which resembled and handled like regular ammunition. It was directed by a laser beam to strike at distances up to 4,000 metres away. The weapon was designated 9K116 Bastion and had a very limited introduction.

As well as being very expensive – the cost of two missiles was the same as a complete tank – it also had the serious tactical disadvantage of effectively taking the gunner out of action for the time it took him (around 12 seconds) to steer the missile to its target 4,000 metres away using a special sight. This weakness was shared by the Bastion's US

counterpart, the MGM-51 Shillelagh. Nowadays though, anti-tank guided missiles that are fired through the main gun's barrel have subsequently become standard equipment on Russian-built tanks.



with their desired vantage point, but enemy tank shells, shrapnel and small arms fire led to the tank commander's dead body – often headless – falling into the tank's interior with embarrassing regularity. This cause of death was so common that tank commanders were instructed to tie their ID tag around their foot, not their neck.

FOR FOUR DAYS, two Israeli armoured brigades – with the help of drop-in reinforcements – managed to hold the line and gain time until new units were mobilised. On the final day, the Israeli tank crews were so exhausted that their fighting spirit was crumbling, but they still managed to meet the final Syrian attack when it collided with the prepared line of defence and defeated it in a series of close-quarter battles.

It was at this point Syrian commanders realised they had failed in their intention to permanently break through Israeli lines, and that a counterattack was a frightening prospect that, having suffered severe losses, it was ill-placed to meet. A general retreat followed, which left the Israelis masters of the battlefield.

Later analysis of the various tank losses indicated that, for example:

- 80 percent of Syrian losses were inflicted by fire from 105-mm L7 guns.
- 70 percent of all duels took place at less than 1,900 metres distance.
- Fire from the L7 gun's armour-piercing projectiles broke through the target's armour in around half all

cases, usually triggering a fire. This was probably due to the unprotected ammunition being held in the turret of the Soviet-built tanks. Strikes on the tightly packed fuel and ammunition stores in the main chassis could also lead to an explosion where the entire turret was blown off.

- The Soviet-built tanks' thick armour and ballistic shape made them difficult to penetrate at the longer ranges favoured by the Israeli crews.
- Where Shot Cal tanks were hit by armour-piercing rounds from 100 and 115-mm (T-62) guns, penetration was achieved by 29 percent of shots, a quarter of which led to internal fires.

THE FIGURES EMPHASISED the urgent need to develop a completely new generation of tanks as well as thoroughly upgrading the T-54/55 in terms of armour, fire control and ammunition. Worryingly, its originally planned successor – the T-62 – saw its own shortcomings ruthlessly exposed.

In the early 1970s the steel-based armour started to be augmented in two different ways, partly with composite armour, but also with explosive ►

“ONCE NIGHT FELL, THE SOVIET-BUILT TANKS HAD AN... ADVANTAGE”



The IMR is a Soviet T-55 fitted with a crane and dozer blade.



The Finnish ItPsv 90 is a self-propelled anti-aircraft gun built on a T-55 chassis.



The MTU-12 is a Soviet bridge-layer with a 12-m span. Built on a T-54 chassis.

The many T-54/55 variants

★ Almost every user of the T54/55 with some technical know-how has developed their own special variant, usually with foreign help. They're often quite similar but have sometimes been modified so far that really only the original chassis and possibly the gun turret remain; everything inside has been replaced.

Of particular interest are the large variety of vehicles rebuilt for special purposes after the gun turret has been removed. Examples include:

- Self-propelled anti-aircraft guns with a new turret containing weapons and fire-control systems for combating targets in the air.
- Mine-clearance vehicles with mine rollers (heavy and front-mounted to hopefully detonate anti-tank mines).
- Mine-clearance device with plough and mounting points for raising and lowering it in front of the drive assembly to deflect anti-tank mines to the side.

- Tanks fitted with an adjustable dozer blade for clearing road obstacles or filling anti-tank ditches.
- Flamethrower tank where the gun has been replaced by a flame projector with a range of up to 200 metres.
- Armoured vehicle-launched bridge carrying a foldable bridge that can be laid out over smaller rivers or other gap-type obstacles.
- Mine-clearance tanks equipped with two mine-clearing explosive line charges. These were projected by rocket in front of the tank and when detonated the two parallel lines would hopefully clear a path through the minefield.
- Towing and repair tanks with lifting crane and winch to both recover other armoured vehicles and for heavy lifting, such as replacing engines.
- Heavy duty armoured personnel carriers for transporting personnel protected by strong armour.
- Self-propelled artillery gun with new

superstructure containing 122-mm gun for delivering indirect fire.

- Tracked fire-fighting vehicle designed to tackle major oil fires.
- One example of a variant refurbished with components from many countries is the Finnish ItPsy 90 self-propelled anti-aircraft gun. This combined the hull of a Polish T-55 with a UK Marksman anti-aircraft gun turret and fire control system, fitted with Swiss 35-mm anti-aircraft autocannons. The turrets are now in storage pending installation on a Leopard 2A4 tank chassis.
- A reverse example – again involving Finland – saw the country purchase 56 T-55 turrets from the Soviet Union in the late 1960s. These were placed as stationary coastal artillery pointing into the Gulf of Finland, and modified with higher gun elevation, the ability to deliver indirect fire and new targeting systems with infrared capabilities. They remained in operation until 2012.

A Finnish T-55 destroys mines with a KMT-5 mine clearance device.



► reactive armour (ERA), which was triggered by – and acted to neutralise – the effects of armour-piercing explosive shells. Both types would later be retrofitted to existing vehicles.

THE SOVIETS ALSO developed the world's first so-called "active tank defence system". It was designed to detect an approaching threat (usually anti-tank missiles), firing its own pre-fragmented projectile when the threat was around seven metres from the tank. It would then detonate, breaking up into shards that would either destroy the threat or trigger its premature explosion. The system, named *Drozd* (Thrush), was extremely expensive and was never installed on the army's T-55s; instead, the Soviets preferred to wait for the new T-72 with its advanced armour. The Naval Infantry, however, couldn't accommodate the heavier T-72 on its landing vessels (designed for T-54/55s), and so accepted the system upgrade happily.

Active tank defence systems were later developed in many variants across a number of countries.

A brand-new generation of tanks started development in the Soviet Union during the 1960s when fundamental flaws with the T-55's successor, the T-62, became apparent. The first tank in the new series was designated T-64 but contained so many technological improvements and was so expensive to manufacture that its introduction to the troops was extremely slow.

As a result, as late as 1988, T-54/T-55s made up 37 percent of Soviet tank numbers, along with 26 percent of T-62s, leaving modern models like the T-64, T-72 and T-80 making up the rest (just over a third in total). Thus, the older types lasted much longer than originally imagined, with technological developments and combat experience forcing updates of the T-54/T-55, partly in new production models until 1981, and partly by modifying the existing vehicles.

THESE MODERNISATIONS ensured the T54-55 lasted for many years, not simply in the countries where they were built, but in the export market too. Those nations had their own preferences and paired the tanks with Western subsystems. The result was a diversity of models and modifications that defied all attempts at categorisation. Soon all the subsystems on the tanks had been affected by upgrades – for example:

- Additional armour, preferably ERA.
- New fire control system with improved sight.
- New gun (the British L7 or variants of it).
- New engine.
- New gearbox.

"THE T-54/55 STILL ROLLS ONTO BATTLEFIELDS IN SYRIA AND AFGHANISTAN TODAY"

- Improved driver's controls.
- New ammunition types.

T-54/55S WITH WIDELY varying modifications and levels of refurbishment began to proliferate throughout the world in the 1970s; a process that would continue for several decades and one where Poland, Czechoslovakia and – not least – China were active suppliers. Since 1989 several countries have been actively selling their ageing stock of T-54/55s to third-world countries, as well as insurgent movements, including terrorists.

During the Iran-Iraq War of 1980–88, T-54/55s were primarily used by Iraq and took part – reportedly successfully – in relatively extensive combat with Iranian Chieftain and M60A1 tanks. Meanwhile, China took the opportunity to sell its type 69 T-55/T-62 hybrid to both sides. During the Iraq Wars of 1990–91 and 2003, Iraq deployed many T-55s, but they achieved with poor results against modern opponents.

On the African continent, T-54/55s have been used in many small wars and even some major conflicts. Notable examples have included fighting between T-54/55s – probably manned by Cuban tank crews – and South African armoured vehicles and Centurion tanks in Angola and Namibia.

Other theatres of war where T-54/55s have seen action are India/Pakistan, Cambodia, Tanzania/Uganda, Sri Lanka, Yugoslavia, Nicaragua, the Congo and Libya.

DESPITE 70 YEARS in service, the T-54/55 still rolls onto battlefields in Syria and Afghanistan today. It has become history's most widely deployed tank, thanks to its good properties in terms of mobility, protection and firepower, extensive upgrades and the fact the tank has proved easy to train personnel on. ★

Johan Lupander is a military historian.

Further reading: **T-54 and T-55 Main Battle Tanks 1944–2004** by Steven J Zaloga (2004) ★
Centurion vs. T-55 Yom Kippur War 1973 by Simon Dunstan (2009).



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Tanks led the charge in Hitler's invasion

When Hitler launched his invasion of the Soviet Union in 1941, tanks were at the forefront of the attack. The armour-clad swept aside all resistance and soon threatened Moscow itself. But when the Soviets rolled out their new T-34s to take on Germany's Panthers and Tigers, the tide of war finally began to turn... Join us this issue as we explore how tanks have shaped our history from the first armoured tractors of WWI to the advanced war machines of the post-war era.

